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Westinghouse Astronuclear Laboratory

Operational Manual for Source Drive
Control Chassis

MASTER

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TITLE: Operational Manual for Source Drive
Control Chassis

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INFORMATION CATEGORY

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1.0 GENERAL

1.1 Introduction

This operational manual covers the Source Drive Control Chassis that is located in Rack 44 at the Test Cell Building. This chassis contains the fuses, switches, and various components and modules that are associated with the Source Drive Control System. Other controls and displays associated with the Source Drive Control System are located on the LRE Console Startup Panel at the Control Point Building.

1.2 Description

The unit consists of a drawer as shown on assembly drawing 936J170, suitable for mounting in a standard 19" rack. Its overall dimensions are 19" wide, 22-1/2" deep, and 7" high.

1.2.1 Front Panel

The front panel of the Source Drive Control Chassis is 19" in width and 7" in height. A handle is mounted at each side of the panel. The left handle is equipped with a spring-operated mechanical latch to retain the chassis in the closed position in the rack. A button at the upper end of this handle releases the latch when pressed. The right handle is equipped with a key lock. The key is removable only when the lock is in the lock position. One indicating fuseholder is located along the lower edge of the front panel. A four-position SOURCE SELECT rotary switch is located at the lower left while a three-position key-operated SOURCE DRIVE momentary switch is located at the lower right of the panel. One SOURCES NOT SHIELDED and three SOURCES EXPOSED/

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SHIELDED indicator lights are located at the upper-left and upper-center of the panel, respectively. One LAMP VERIFY switch-indicator is located at the upper-right of the panel.

1.2.2 Chassis

The chassis consists of a frame with chassis slides bolted to the sides. Inside the chassis is the component plate to which the printed circuit board guides and connectors are mounted. On the left side of the component plate, provision is made for one row of 10 printed circuit board cards. However, only the first eight slots of the row are occupied with cards. This row contains eight Relay module cards.

On the rear of the chassis are two connector plates; each plate having one multi-pin connector. One connector is a power connector with 16 pins, while the remaining connector has 55 pins and is used for the signal leads.

1.2.3 Component Panel

Bolted across the top of the chassis at the front is the component panel. This panel contains 12 test point tip jacks arranged in a row across the panel.

2.0 INSTALLATION

2.1 Incoming Inspection

The equipment was carefully inspected both mechanically and electrically before shipment. It should be physically free of mars, dents, or scratches and should be in perfect electrical order upon receipt. To confirm this, the equipment should be inspected

for physical damage from transit and tested for electrical performance using the procedure of Section 5.0. If there is damage or deficiency, repairs should be made before final use.

2.2 Mounting

CAUTION: Before installation of the chassis make sure that all power and signals to the rack are turned off to prevent possible damage to the equipment or injury to personnel.

The chassis is to be mounted in Rack 44 as the sixth drawer from the top. Mount the removable portion of the chassis slides at the desired level of the rack and insert the Source Drive Control Chassis in the slides. Refer to Drawing 936J170 for mounting dimensions, and construction details of the chassis, panel, and connectors. Connect the mating cables to the connectors at the rear of the chassis.

2.3 Power Requirements

Power is obtained from external sources and enters the unit through the rear mounted 16 pin connector. The nominal voltage and current requirement for the chassis is 28 VDC at 3 amps.

3.0 PRINCIPLES OF OPERATION

The primary function of the Source Drive Control Chassis is to supply the remote controls and displays at the Test Cell Building for the source drive system.

The purpose of the remote control system for the neutronic instrumentation checkout source drive system is to remotely position the checkout sources via the source drive system

from the test cell building or the control room to an exposed position, that being a position where the neutron detectors will read up-scale at least one decade as a result of the incident neutrons from the source, or to a shielded position, that being a position where the source strength is sufficiently shielded that the neutrons incident on the detectors from the source is less than those incident on the detector due to reactor generated neutrons. Refer to schematic drawing 928F925 to understand the operation of the various components and modules in the chassis.

3.1 Fuseholders

The fuseholder used on the Source Drive Control Chassis is the Master Specialties Series 70E indicating type. These units contain a limiting resistor and lamps in parallel with the fuse, so that they are energized when the fuse opens. In addition, the fuseholder has been modified to include an encapsulated transistor-amplifier circuit attached to the back end of the holder to ensure proper indication of failure in cases where the circuit load is not heavy enough.

All the power required by the Source Drive Control Chassis is supplied through fuse F1. The requirement is 1 ampere at 28 VDC to operate relays and the various switch-indicators.

3.2 Selector Switches

A four-position SOURCE SELECT selector switch is mounted on the front panel. It is used to select the desired source, or sources that are to be driven by the SOURCE DRIVE command switch which is also on the front panel. The SOURCE DRIVE

switch is a three-position key-switch that is paired with an identical key-switch on the LRE Startup Panel to allow for operation of only one of the two key-switches at a time. It is a spring-return center-rest switch with the center position being "OFF." When held in the "EXPOSE" position, a relay on the test car is operated which remotely positions the checkout source (or sources) to the exposed position. Likewise, when held in the "SHIELD" position a relay on the test car is operated which remotely positions the checkout source (or sources) to the shielded position.

3.3 Switch-Indicators

The type of switch-indicator used on the front panel is the Master Specialties Series 10E Twist-Lite. The Master Specialties Series 10E Twist-Lite is a flush-mounted, illuminated push-button switch. The combined capability of a word indicator and a push-button switch is provided within this unit. Depressing the front lens face actuates the switch contacts which are either momentary or alternate action.

3.3.1 EXPOSED/SHIELDED Indicators

The purpose of the three sources EXPOSED/SHIELDED indicator lights is to display the position of each of the checkout sources. The sources at the test car operate EXPOSED or SHIELDED limit switches which, in turn, operate associated relays located in the Source Drive Control chassis. Twenty-eight VDC power is fed through normally-open contacts of each relay to operate the respective indicator lights.

3.3.2 SOURCES NOT SHIELDED Indicator

The purpose of the SOURCES NOT SHIELDED indicator light is to

display whenever any source is not in the shielded position. Twenty-eight VDC power for the light is fed through paralleled normally-closed contacts of the three relays that are operated by the three sources shielded limit switches. Thus, if any one of the sources is not shielded the light will be ON.

3.3.3 Lamp Verify

The Lamp Verify test circuit consists of the diode modules attached to the backs of the indicator lights along with the LAMP VERIFY switch on the front panel of the Chassis.

The purpose of the circuit is to test all the indicator lamps located on the front panel of the chassis. All the lamps should go ON whenever the LAMP VERIFY switch is pressed.

3.4 Relay Modules

Each Relay Module consists of one G. E. Type 3SAH 4PDT relay with a protective 1N645 diode across the coil mounted on a plug-in printed circuit card. (Drawing 978D866G02.)

The relays are energized with 28 VDC power which is controlled by the source limit switches on the test car or the key switch on the LRE Console as indicated on the schematic drawing 928F925. There are eight Relay Modules located in the Source Drive Control Chassis. Connections to the relay contacts vary depending upon their application as shown on the schematic drawing. The six limit switch relays are associated with the indicators on the chassis and the LRE Console. The other two relays are associated with the

control switches. Operation of the Key Switch on the LRE Console energizes these two relays and closes contacts which are connected in parallel with the SOURCE SELECT switch contacts on the Source Drive Control Chassis. This permits remote control from the LRE Console.

4.0 OPERATION

After the chassis has been installed and tested in accordance with the applicable sections of the Test Specification and Procedure, no further procedures are required.

5.0 MAINTENANCE

5.1 Preventive Maintenance

The equipment is designed so that no special maintenance procedures are required other than the normal good housekeeping rules used for similar type electronic equipment.

5.2 Corrective Maintenance

Major corrective maintenance is performed at the factory or by a Westinghouse field representative. Alignment and replacement of obviously faulty components may be performed locally by a skilled technician. There are no specially selected or matched components used, therefore, components may be replaced by locally available parts of identical value and tolerance.

If there is any apparent or suspected failure or improper functioning of the equipment, the equipment should be checked-out in accordance with the Test Specification and Procedure.

6.0 TEST SPECIFICATION AND PROCEDURE

The proper Test Specification and Procedure is:

T-711876 - Source Drive Control Chassis.

7.0 DRAWING LIST

936J170	Source Drive Control Chassis
928F925	Schematic Diagram - Source Drive Control
978D866	Relay Module
979D442	Fuseholder, Driven Indicator

8.0 PHOTOGRAPH LIST

Figure 1	Source Drive Control Chassis - Top View
Figure 2	Source Drive Control Chassis - Bottom View
Figure 3	Source Drive Control Chassis - Front View
Figure 4	Source Drive Control Chassis - Rear View
Figure 5	Relay Module - 4PDT

TEST SPECIFICATION NUMBER T-711876

TITLE

Acceptance Test Specification and Procedure

SOURCE DRIVE CONTROL CHASSIS ETS-1 (TSCS)

DATE: October, 1966

PREPARED BY: Harry Kowalcheck
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E.J. McQuade 11-1-66
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R.A. Emiger 10/27/66
Authorized Classifier Date

ACCEPTANCE TEST SPECIFICATION

Source Drive Control Chassis

1.0 SCOPE

This document contains the requirements for the acceptance testing of the Source Drive Control Chassis (WANL Drawing 936J170) of the ETS-1 Test Stand Control System.

2.0 REQUIREMENTS

2.1 The acceptance test shall consist of the following:

2.2.1 Visual Examination - To be performed by Quality Control.

2.2.2 Weights and Dimensions - To be performed by Quality Control.

2.2.3 Functional Test - To be performed by Electronics and Instrumentation and witnessed by Quality Control.

2.2 The acceptance test shall be performed in the order of and as specified in the procedure. Discrepancies found during the visual examination shall be corrected and reinspected before performing the functional test. Failure or inability to obtain a required measurement during formal functional testing shall result in establishing a "hold" on the test. The failure or inadequacy shall be recorded by Quality Control and shall be reviewed by the WANL Engineering Review Board (ERB). The equipment shall be repaired and sections

2.2 (Continued)

of the test repeated as determined by the ERB. Visual examination shall be performed on the reworked or repaired areas before resuming testing.

3.0 APPLICABLE DOCUMENTS

3.1 Drawing 936J170 - Source Drive Control Chassis

3.2 Drawing 928F925 - Schematic Diagram - Source Drive Control Chassis

3.3 NDC-118A NERVA Design Criteria ETS-1 TSCS (AGC)

4.0 EQUIPMENT REQUIRED

4.1 Multimeter (Simpson 269 or equivalent)

4.2 28VDC+2VDC power source

ACCEPTANCE TEST PROCEDURE

Source Drive Control Chassis

1.0 SCOPE

This document contains the procedures for acceptance testing the Source Drive Control Chassis (WANL Drawing 936J170) of the ETS-1 Test Stand Control System in accordance with the Acceptance Test Specification.

2.0 VISUAL EXAMINATION

The equipment under test shall be presented in its final form together with the applicable schematic and assembly drawing. The visual examination shall consist of the following parts:

2.1 Workmanship, Assembly and Fit

The inspector shall inspect the equipment for workmanship to NASA requirements, and to assure that the overall chassis is of the proper dimensions per the assembly drawing, Westinghouse Drawing Number 936J170.

Rev. _____.

Workmanship OK _____

2.2 Materials, Parts, and Finishes

The equipment shall be inspected to assure that the materials, parts, and finishes are in accordance with the applicable assembly drawings.

Incoming inspection records on materials, parts, and finishes shall be utilized to determine conformance to the assembly drawings where possible.

Materials OK _____

2.3 Treatment for Prevention of Corrosion

The equipment shall be inspected to assure that the coatings for prevention of corrosion have not been impaired during the manufacturing cycle.

Treatment OK _____

2.4 Safety Requirements

The equipment shall be inspected to insure that no safety hazard, such as sharp edges, etc., exist on the equipment which are potential hazards to personnel operating or maintaining the equipment.

Safety OK _____

2.5 Marking

The markings on the equipment shall be inspected to ensure conformance to the applicable drawings and to assure that they are acceptable as to permanence and readability.

Marking OK _____

2.6 Visual Examination Review

After the visual examination of the equipment has been completed, all deficiencies shall be reviewed by WANL Engineering and Quality Control and corrected by one of the following methods:

- a. Drawing changes where drawing deficiencies are noted.
- b. Design changes if necessitated.
- c. Rework of the parts affected.

3.0 WEIGHTS AND DIMENSIONS

3.1 The unit shall be weighed and the weight shall be recorded.

Weight _____ lbs.

3.2 The unit shall be measured and the overall dimensions of width, height, and depth recorded.

Width _____ in.

Height _____ in.

Depth _____ in.

4.0 FUNCTIONAL TESTS

Before performing the functional tests, check all the fuses to insure that the proper fuses are installed in the fuseholders.

4.1 Limit Switch Relays and Indicators

4.1.1 Connect +28VDC power source to connector pin J1-A with return lead to J1-B.

- 4.1.2 Refer to Table 1. Apply +28VDC to the various test points listed in Table 1 by connecting a jumper from test point TP1. Verify the conditions listed in Table 1.
- 4.2 Remote Sources Exposed Indicator Circuit
 - 4.2.1 Use an ohmmeter to measure resistance between connector pins J2-m and J2-t.
 - 4.2.2 Refer to Table 2. Apply +28VDC to the various connector pins listed in Table 2. Verify the conditions listed in Table 2.
- 4.3 Sources Not Shielded Indicator Circuit
 - 4.3.1 Use an ohmmeter to measure resistance between connector pins J2-k and J2-j and between connector pins J2-n and J2-w.
 - 4.3.2 Refer to Table 3. Apply +28VDC to the various connector pins listed in Table 3. Verify the conditions listed in Table 3.
- 4.4 Control Switch Circuits
 - 4.4.1 Use a voltmeter to measure the output volts DC at connector pins J2-b, J2-c, J2-d, J2-f, J2-g, and J2-v.
 - 4.4.2 Refer to Table 4. Operate the control switches as listed in Table 4. Verify the conditions listed in Table 4.
- 4.5 C. P. Command Relays
 - 4.5.1 Use a voltmeter to measure the output volts DC as in Step 4.4.1 above.

4.5.2 Connect a jumper wire between test points TP2 and TP12.

Connect a jumper wire between connector pins J2-H and J2-S.

4.5.3 Place SHIELD/EXPOSE switch S2 in OFF position. Place SOURCE SELECT switch S3 in No. 1 position.

4.5.4 Refer to Table 5. Apply +28VDC to the various test points listed in Table 5 by connecting a jumper from test point TP1. Verify the conditions listed in Table 5.

4.6 Lamp Verify Switch

Check the operation of the Lamp Verify switch. All indicator lights should go ON when switch is pressed.

Lamp Verify OK _____

4.7 Fuse Test

Verify the operation of the fuse indicator. The fuse indicator should be "OFF" with the fuses in place and "ON" with the fuses removed from the fuseholder.

Fuse Indicator OK _____

4.8 Continuity Test

4.8.1 Remove the 28VDC power source from the chassis.

4.8.2 Use an ohmmeter to measure the resistance between the various points listed in Table 6. Verify the conditions listed in Table 6.

4.9 Isolation Test

Use an ohmmeter to measure the resistance between each connector pin and chassis ground. Verify that the resistance is greater than 10 megohms.

Isolation OK _____

TABLE 1

<u>Connect +28VDC</u>	<u>Relay</u>	<u>Indicator</u>	<u>(OK)</u>
X	A1K1 OFF	No. 1 Exposed OFF	_____
TP3	A1K1 ON	No. 1 Exposed ON	_____
X	A2K1 OFF	No. 1 Shielded OFF	_____
TP6	A2K1 ON	No. 1 Shielded ON	_____
X	A3K1 OFF	No. 2 Exposed OFF	_____
TP4	A3K1 ON	No. 2 Exposed ON	_____
X	A4K1 OFF	No. 2 Shielded OFF	_____
TP7	A4K1 ON	No. 2 Shielded ON	_____
X	A5K1 OFF	No. 3 Exposed OFF	_____
TP5	A5K1 ON	No. 3 Exposed ON	_____
X	A6K1 OFF	No. 3 Shielded OFF	_____
TP8	A6K1 ON	No. 3 Shielded ON	_____

TABLE 2

<u>Connect +28VDC</u>	<u>Relays</u>	<u>Ohmmeter J2-m to J2-t</u> (OK)
J2-M J2-P J2-K	A1K1 ON A3K1 ON A5K1 ON	< 1 Ω _____
X J2-P J2-K	A1K1 OFF A3K1 ON A5K1 ON	∞ _____
J2-M X J2-K	A1K1 ON A3K1 OFF A5K1 ON	∞ _____
J2-M J2-P X	A1K1 ON A3K1 ON A5K1 OFF	∞ _____

TABLE 3

<u>Connect +28VDC</u>	<u>Relays</u>	<u>Sources Not Shielded Indicator</u> (OK)	<u>Ohmmeter J2-k to J2-j</u> (OK)	<u>Ohmmeter J2-n to J2-w</u> (OK)
J2-N J2-L J2-J	A2K1 ON A4K1 ON A6K1 ON	OFF	∞	$< 1 \Omega$
X J2-L J2-J	A2K1 OFF A4K1 ON A6K1 ON	ON	$< 1 \Omega$	∞
J2-N X J2-J	A2K1 ON A4K1 OFF A6K1 ON	ON	$< 1 \Omega$	∞
J2-N J2-L X	A2K1 ON A4K1 ON A6K1 OFF	ON	$< 1 \Omega$	∞

TABLE 4

Shield/Expose Switch	Source Select Switch	Output VDC					
		J2-f	J2-c	J2-b	J2-d	J2-v	J2-g
OFF	No. 1	OV	OV	OV	OV	OV	OV
"	No. 2	OV	OV	OV	OV	OV	OV
"	No. 3	OV	OV	OV	OV	OV	OV
"	All	OV	OV	OV	OV	OV	OV
SHIELD	No. 1	OV	OV	OV	+28V	OV	OV
"	No. 2	OV	OV	OV	OV	+28V	OV
"	No. 3	OV	OV	OV	OV	OV	+28V
"	All	OV	OV	OV	+28V	+28V	+28V
EXPOSE	No. 1	+28V	OV	OV	OV	OV	OV
"	No. 2	OV	+28V	OV	OV	OV	OV
"	No. 3	OV	OV	+28V	OV	OV	OV
"	All	+28V	+28V	+28V	OV	OV	OV

NOTE: Relays A7K1 and A8K1 de-energized.

TABLE 5

<u>Connect +28VDC</u>	<u>Relays</u>	<u>J2-f</u>	<u>J2-c</u>	<u>Output VDC</u> <u>J2-b</u>	<u>J2-d</u>	<u>J2-v</u>	<u>J2-g</u>
X	A7K1 OFF	OV _____	OV _____	OV _____	X	X	X
X	A8K1 OFF	X	X	X	OV _____	OV _____	OV _____
TP9	A7K1 ON	+28V _____	+28V _____	+28V _____	X	X	X
TP10	A8K1 ON	X	X	X	+28V _____	+28V _____	+28V _____

NOTES: Shield/Expose Switch S2 in OFF position.

Source Select Switch S3 in No. 1 position.

TABLE 6

<u>Ohmmeter</u>		<u>Reading</u>	
<u>From</u>	<u>To</u>		(OK)
TP2	J1-B	< 1 Ω	_____
TP9	J2-R	< 1 Ω	_____
TP10	J2- <u>e</u>	< 1 Ω	_____
TP11	J2- <u>k</u>	< 1 Ω	_____
TP12	J2-S	< 1 Ω	_____
J1-E	Chassis	< 1 Ω	_____

Figure 1

Source Drive Control Chassis - Top View

Figure 2

Source Drive Control Chassis - Bottom View

Figure 3
Source Drive Control Chassis - Front View

Figure 4
Source Drive Control Chassis - Rear View

Figure 5
Relay Module - 4PDT

Drawing No. 936J170
Source Drive Control Chassis

Drawing No. 928F925
Schematic Diagram - Source Drive Control

Drawing No. 978D866

Relay Module

Drawing No. 979D442