

AC SPARK PLUG DIVISION General Motors Corporation Milwaukee, Wisconsin	EXPERIMENTAL DESIGN EXHIBIT	XDE 34-T-50	REV
	BY R. Glasgow	DATE 9/1/65	TOTAL PAGES 8 PAGE 1

RESOLVER CIRCUIT TESTER BLOCK II AND
LEM SYSTEM DESIGN CRITERIA

1.0 SCOPE

1.1 This document establishes the design requirements for the Resolver Circuit Tester (RCT), which is a piece of associated Ground Support Equipment.

2.0 APPLICABLE DOCUMENTS

2.1 The following documents serve in understanding and developing the Resolver Circuit Tester.

_____	General Specification for Apollo Ground Support Equipment
2900286	Resolver Circuit Tester
2900214	Mechanization Diagram Resolver Circuit Tester (Blk II & LEM)
PS 2900128	Procurement Specification, Decade Error Bridge Assembly
2900127	Specification Control Drawing Decade Error Bridge Assembly
_____	Procurement Specification, Resolver Transmitter Pair

3.0 REQUIREMENTS

3.1 GENERAL - The Resolver Circuit Tester is a precise, portable unit which must perform a dual function. One, the tester must be capable of simulating resolver signals to the normal system resolver loads. Two, the tester must be capable of monitoring the actual or simulated resolver signals, as the signals are applied to the normal loads.

3.2 TEST CONFIGURATION - The RCT shall be available for checkout of various airborne resolver systems. The systems are:

- a. IMU IG { Coarse } Sine and Cosine
 { Fine }
- b. IMU MG { Coarse } Sine and Cosine
 { Fine }
- c. IMU OG { Coarse } Sine and Cosine
 { Fine }
- d. Sextant Shaft { Fine } Sine and Cosine
- e. Sextant Trunnion { Fine } Sine and Cosine

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- f. Rend. Radar Shaft { Coarse } Sine and Cosine
 { Fine }
- g. Rend. Radar Trunnion { Coarse } Sine and Cosine
 { Fine }

The RCT shall be used primarily to simulate inputs to the Rend. Radar during G&N level test. The RCT shall also be used to troubleshoot the radar at ISS level test. The IMU resolver systems shall be checked only at ISS level test. The RCT shall be used to checkout the Sextant resolver systems only during OSS level test. The IMU gimbal systems shall have separate input channels to the RCT. The sextant and rend. radar systems shall share input channels to the RCT.

3.3 CIRCUITS - The following circuits are required to satisfactorily fulfill the functions of the resolver circuit tester:

- a. "POWER ON" Capability
- b. Reference Excitation Selection Capability
- c. Mode Selection Capability
- d. Operate Channel Selection Capability
- e. Monitor Signal Selection Capability
- f. Transmitter Pair Capability
- g. Decade Error Bridge Assembly Capability
- h. Rack Facility Capability

3.3.1 "POWER ON" Capability - The capability shall exist to manually control power inputs to the RCT. This capability shall govern the reference excitation and electronics power inputs. A lighted, visual display of "POWER ON" is required.

3.3.2 Reference Excitation Selection Capability - The selection of Spacecraft or Optics 28 V 800 CPS 1% reference excitation shall be automatically performed in the GSE Distribution Gox (GDB). During IMU Gimbal or Rend. Radar resolver systems checkout, the decade error bridge and transmitter pair must be provided with spacecraft reference excitation. During optic resolver systems checkout, the bridge and transmitter pair must be provided with optics reference excitation.

The reference excitation must be fused in the RCT with an indicating type fuse.

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- 3.3.3 Mode Selection Capability - The RCT shall have two modes of operation, "READ" or "SET". The capability shall exist to manually select either mode of operation. There shall be a lighted, visual display of the mode selected. If input power to the RCT is lost, the unit shall assume the "READ Mode" condition.
- 3.3.3.1 READ Mode - This mode of operation shall allow the resolver signals of the selected airborne system to pass to the monitor signal selection where the coarse or fine signals become monitorable inputs to the Decade Error Bridge Assembly.
- While in the "READ Mode" it shall be impossible for the resolver transmitter pair outputs to enter the channels of the selected system.
- If a sextant resolver signal is selected for "READ" an electrical indication shall be provided to the Table Mounted Junction Box (TJB) enabling the system to be read.
- 3.3.3.2 SET Mode - This mode of operation shall allow the resolver transmitter pair outputs to enter the channels of the selected resolver system. Selection of the set mode shall provide an electrical indication to the appropriate junction box (GDB for IMU or Rend. Radar; TJB for Optics) which will electronically disconnect the source resolvers from their normal loads. When a verification of the disconnect is received, the transmitter pair outputs shall be allowed to pass to the normal resolver loads. There shall be a lighted, visual display that the verification has occurred.
- 3.3.4 Operate Channel Selection Capability - The capability of manually selecting any one of the seven resolver systems for checkout. There shall be a lighted, visual display of the selected channel.
- By selecting a system, a path shall be created for "READ" signals to pass from the particular resolver to the decade error bridge for monitoring or for the simulated "SET" signals from the transmitter pair to the appropriate resolver loads.
- Signal selection shall be so mechanized that manual selection of any one system shall result in disabling any other selected system.
- If either the shaft or trunnion channel is selected an electrical indication shall be provided to the GDB.
- If input power to the RCT is lost, all channels shall assume an unselected condition.

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- 3.3.5 Monitor Signal Selection Capability - The capability shall exist to manually select for monitoring either the coarse or fine resolver signals from the air borne or simulated system that is in operation. There shall be a lighted, visual display of the type of signals selected. If input power to the RCT is lost, monitor selection shall assume the "READ COARSE" condition.
- 3.3.6 Transmitter Pair Capabilities - The Resolver Transmitter Pair will be used to simulate the system resolvers coarse and fine signals. The transmitters shall be a two-speed system made up of a 1X and 16X set.

The transmitter pair shall be coarsely positioned by a panel mounted dial. Fine positioning shall be accomplished with a veinier on the panel mounted dial and the Decade Error Bridge Assembly.

The following requirements apply to the Resolver Transmitter pair;

	<u>1X</u>	<u>16X</u>
Input Voltage	28V \pm 2%	28V \pm 2%
Input Frequency	800 CPS \pm 10 CPS	800 CPS \pm 10 CPS
Transformation Ratio	1.00 \pm 3%	0.179 \pm 3%
Input Impedance	_____	_____
Output Impedance	_____	_____
Angular Error (Mechanical Degrees)	3 min. max.	10 sec max.
Phase Shift	3.3 $^{\circ}$ \pm 0.5 $^{\circ}$	5.5 $^{\circ}$ \pm 1.5 $^{\circ}$
Null Voltage	_____	_____

- 3.3.7 Decade Error Bridge Assembly Capabilities - The Decade Error Bridge Assembly shall be a commercial unit **equivalent to** the Singer Company Jertsch Line. The bridge shall be used to monitor selected signals of functioning resolver systems. The bridge shall also be used to monitor the simulated resolver signals from the resolver transmitter pair. A detailed description of the bridge requirements is given in PS 2900128. The following is a brief summary of the bridge requirements:

Range:	0 $^{\circ}$ - 360 $^{\circ}$ (continuous)
Null Accuracy:	4 sec
Power:	20 volt-amps max.
Inputs:	Signals - 120 v rms max. 800 CPS, across sin & cos inputs

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3.3.7 (Con't)

Reference - $28V \pm 2\%$ @ 800 CPS \pm 20 CPS

Impedance - Input - $400K\Omega$ min. @ $\sin \theta$ or $\cos \theta$
 $100K\Omega$ min. Signal
 $100K\Omega$ min. Reference
Output - 420Ω with Zero Impedance
Input

3.3.8 Rack Facility Capability

To aid the RCT at the site locations, the following conveniences are required with the RCT.

- a. Multiple - Receptacle electrical outlet - The Decade Error Bridge assembly will receive its 115 V 60 ~~A~~ prime power from this outlet.
- b. Fifteen feet of extension cord - This cord will be used to route the facility wall power to the RCT multiple receptacle.

3.4 INPUTS - The following inputs will be associated with the Resolver Circuit Tester:

- a. 28V 800 CPS 1% Spacecraft or Optics Reference Excitation
- b. +27 VDC Relay and Lamp Power (Fused in the RCT)
- c. 28V 800 CPS Coarse Resolver Signals
- d. 5V 800 CPS Fine Resolver Signals
- e. 115V 60 CPS Decade Error Bridge Prime Power
- f. 27 VDC LOW Set Verifications

3.5 OUTPUTS - The following outputs shall be available from the resolver circuit tester.

- a. +27 VDC Set Command Signals
- b. 28V 800 CPS Coarse Resolver Signals
- c. 5V 800 CPS Fine Resolver Signals

3.6 LOADS

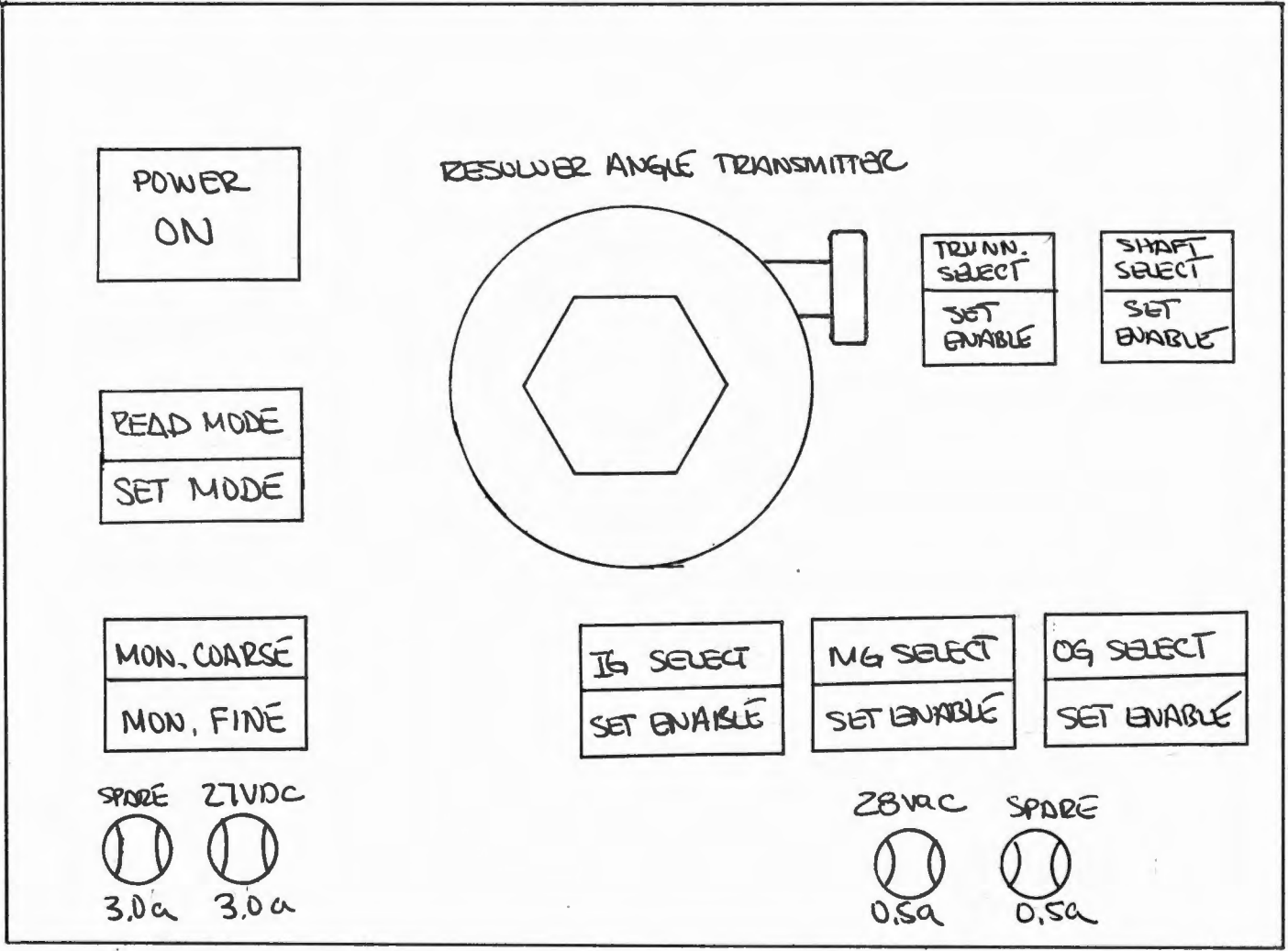
The RCT will impose the following loads on the available power supplies,

28V 800 CPS 1%	300 ma (nominally)
27 VDC RLP	2.0 amps (nominally)

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