Modifications to Sinclair Radio Laboratories model range antenna system type 20 A1

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MODIFICATIONS TO SINCLAIR RADIO LABORATORIES MODEL RANGE ANTENNA SYSTEM TYPE 20 A1

– J. Hazell –

ERB-879

APRIL 1973

RADIO AND ELECTRICAL ENGINEERING DIVISION

DIVISION DE RADIOTECHNIQUE ET DE GENIE ELECTRIQUE

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C O N T E N T S

	Page
Introduction and Acknowledgment	1
General Description	1
Horn Rotator	2
Antenna Cart and Turntable	3
Model Tower Post Assembly	3
Power Supply	3
Indicator Unit	4
Interconnecting Cables	4
Synchro Selector Panel	8
References	10

FIGURES

1.	Model Range System Block Diagram	2
2.	Wiring Block Diagram	4
3.	Synchro Information Switching Arrangement between Indicators and Recorders	9

TABLES

1.	Wire Routing Table - Horn Rotator	5
2.	Wire Routing Table - Cart Turntable	6
3.	Wire Routing Table - Cart Spindle	7

PLATES

1.	Aircraft Range Control Rack with Indicator, Synchro, and Indicator Panels	11

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INTRODUCTION

This system, located in the fourth floor penthouse, Electromagnetic Engineering Section, Radio Division, was originally installed in the spring of 1953. It was built specially for N.R.C. by Sinclair and has performed adequately over the years. A home-built power supply provided the necessary voltages to drive the motors and 16:1 synchro system operating through a converter, drove the Scientific Atlanta recorders, whose synchro systems had ratios of 36:1 and 1:1.

After twenty years, it was decided to completely dismantle, and rebuild the system with various modifications. This work was carried out from December, 1972 and January, 1973; the purpose of this summary is to record these modifications for future reference. Appreciation is extended to Messrs. J. Dunn and A. Grünwald who carried out most of the mechanical overhaul of the units, and to Mr. L. Woods who designed and fabricated the synchro assemblies.

GENERAL

Basically, this range consists of three main functions - Horn Rotator, Cart Turntable and Tower Spindle - all driven by DC motors supplied from a common power supply. Each system provides return indication information with its own synchro arrangement. See Figure #1.

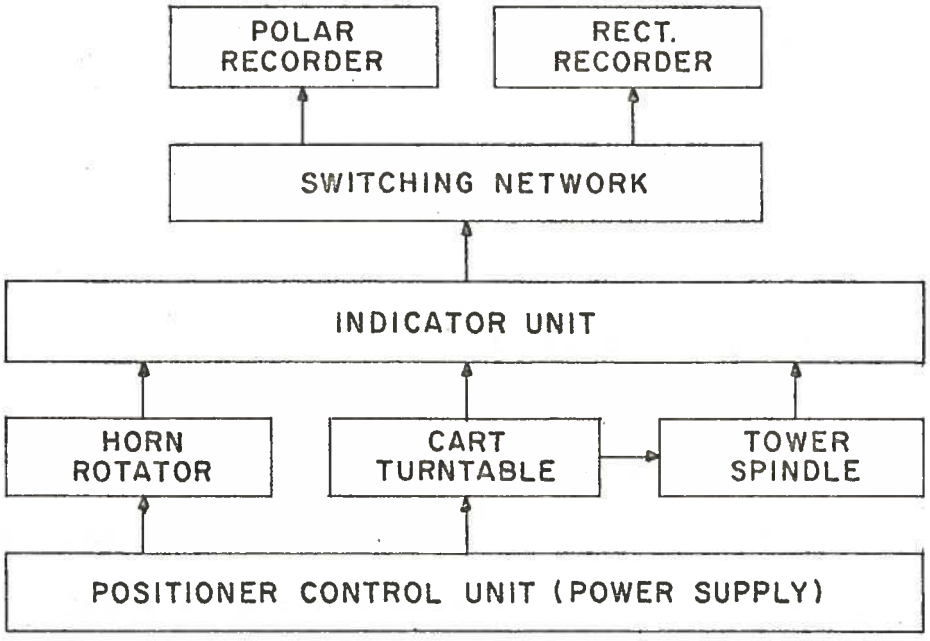


FIG. 1 - MODEL RANGE SYSTEM BLOCK DIAGRAM

HORN ROTATOR

The unit was taken out of the wall mount in the East Wall; the limit switch assembly and auxiliary push button stations were both discarded; the General Electric 2J55V1 selsyn generator was removed but retained for possible future use elsewhere. Two new Vernitron synchro transmitters, type 23TX6A, were installed in conjunction with a gear train assembly. This assembly was designed to convert the speed ratio of 16:1 at the end of the gear motor counter-shaft, to both 1:1 and 36:1. This information is then sent back along multiconductor cable to the S.A. recorders where it is reconverted via more synchro receivers and gear trains to drive the chart paper system at true rotator speed.

Cylinder sleeve bearings were lubricated with low temp Lubriplate grease, as was the ring gear and worm gear assembly.

Motor and Synchro wiring was replaced; (see Wire Routing Table #1).

ANTENNA CART AND TURNTABLE

This unit needed considerable attention; all wiring was replaced, a similar synchro arrangement as above was installed, and the DC motor and associated gear-box were dismantled and overhauled. The four wheels were removed and their bearings cleaned and relubricated. Three of the four adjustable brake shoes were discarded due to seized threads. A 300 watt lamp and socket were permanently installed - in the winter time, sufficient heat should be radiated to warm the gear-box oil. The ten conductor slip-rings were polished and wires checked out leading up through the central column. (Wire Route Table #2.)

MODEL TOWER POST ASSEMBLY

A single new synchro transmitter geared for a 1:1 ratio was installed due to limitations of conductors up through the slip-rings; the only wiring which could not be replaced was that from inside the slip-ring column. New connectors were installed in the wiring leading to "Spindle" motor and synchro. (Wire Route Table #3.)

POWER SUPPLY

A Scientific Atlanta Positioner Control Unit, Model PC 2-33, was utilized, replacing the older home-brew supply. Full details concerning this supply may be found in the S.A. Manual.

INDICATOR UNIT

A Scientific Atlanta Series 4423 Unit was purchased for this range. It consists of three indicators; one each for Cart Truntable, Horn Rotator and Tower Spindle. Recorder chart drive information is available from connectors wired in parallel with the indicator unit S1, S2, S3, terminals. Ref: S.A. Instruction Manual.

INTERCONNECTING CABLES

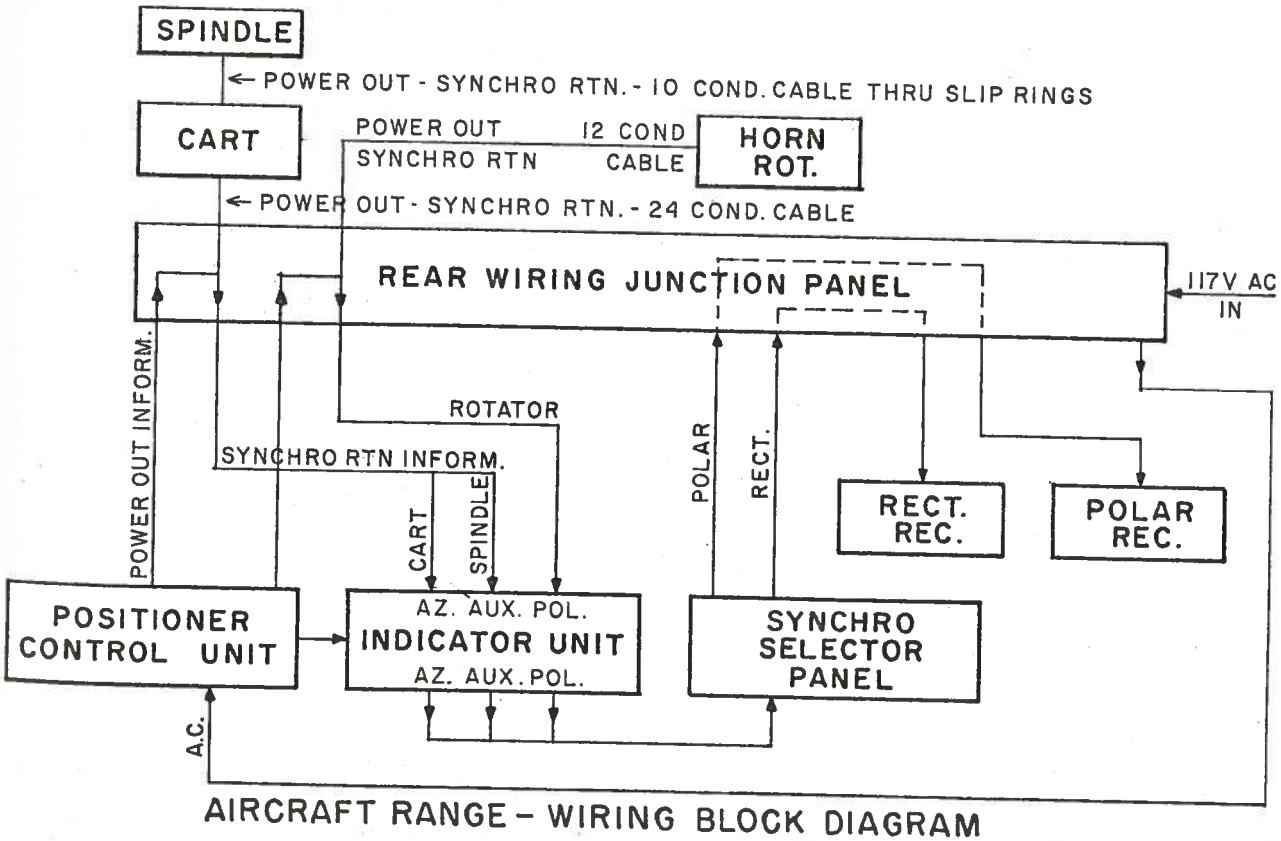
There are three main multiconductor cables as follows:

1) 24 cond. from Control Unit to inside wall terminal;

2) 24 cond. from outside wall terminal to cart;

3) 12 cond. from Control Unit to Horn Rotator.

All of the connectors on these cables were rewired. (See Wiring Tables 1,2,3), Figure 2.



AIRCRAFT RANGE - WIRING BLOCK DIAGRAM

FIG. #2

Wire Routing Table #1

Horn Rotator

	Chassis Term.	Wire Colour	Rear Panel Cannon Pin #	Multi-Cond. Wire Colour	Rotator-Wall Cannon Pin #	Wire Colour	Terminal Strip	Wire Colour	Function
Positioner Control Plug J1*	N	Brown	1	Black & White	1	Brown	1	Black	A1
	R	White	2	Blue	2	White	2	Black	A2
	T	Black	3	Red & White	3	Black	3	Black	S1
	D	Black	4	Black & Yellow	4	Black	4	Black	S2, F2
	B	White	7	Yellow	7	White	7	Black	F1
Indicator Unit J2 (Polarization)	A	Brown	8	Blue & White	8	Brown	8	Gray & White	R1(1:1,36:1)
	C	Black	9	Brown	9	Black	9	Gray	R2(1:1,36:1)
	D	White	10	Black & Red	10	White	10	Red	S1(1:1)
	E	Brown	11	White	11	Brown	11	Orange	S2(1:1)
	H	Black	12	Black	12	Black	12	Brown	S3(1:1,36:1)
	G	White	13	Red	13	White	13	Orange	S1(36:1)
	F	Brown	14	Green	14	Brown	14	Yellow	S2(36:1)

Motor Synchros

* Limit Switches shorted—"J" & "F" jumpered to "L"

Wire Routing Table #2

CART TURNTABLE

	CHASSIS TERM.	WIRE COLOUR	REAR PANEL CANNON (24 COND) PIN #	PIN # AT -INT. WALL BOX -EXT. WALL BOX -CART CONNECTOR	CART BASE WIRE COLOUR	TERMINAL STRIP	WIRE COLOUR	FUNCTION	
POSITIONER CONTROL PLUG J2*	M	Black	A	A	White	A	Black	A1	MOTOR
	R	Brown	B	B	Black & White	B	Black	A2	
	S	Black	C	C	White	C	Black	S1	
	D	White	D	D	White	D	Black	S2F2	
	A	White	G	G	Brown & White	G	Black	F1	
INDICATOR UNIT J1 (AZIMUTH)	A	Black	T	T	Brown & White	T	Gray	R1(1:1,36:1)	SYNCHROS
	C	White	U	U	White	U	Gray & White	R2(1:1, 36:1)	
	D	Brown	V	V	Black & White	V	Red	S1(1:1)	
	E	Black	W	W	Black & White	W	Orange	S2(1:1)	
	H	Brown	X	X	White	X	Brown	S3(1:1, 36:1)	
	G	Brown	Y	Y	Brown & White	Y	Orange	S2(36:1)	
	F	White	|D|	|D|	Brown & White	|D|	Yellow	S1(36:1)	

* Limit Switches shorted–"E" & "H" jumpered to "L"

SWITCHED A.C.	|E|	|E|	Black & White	|E|	#14 White	110V	HEATER LAMP
	|F|	|F|	White	|F|	#14 Black	AC	

Wire Routing Table #3
CART SPINDLE

	CHASSIS TERM.	WIRE COLOUR	REAR PANEL CANNON (24 COND.) PIN #	PIN # AT -INT. WALL BOX -EXT. WALL BOX -CART CONNECTOR	CART BASE WIRE COLOUR	TERM. STRIP (TO SLIP-RINGS)	10 COND. CONNECTOR PIN #	WIRE COLOUR	MOTOR-SYNCHRO TERM. STRIP	WIRE COLOUR	FUNCTION	
POSITIONER CONTROL PLUG J2*	P	White	H	H	White	H	A	White	A	Orange	A1	MOTOR
	R	Brown	I	I	Brown & White	I	B	Brown	B	Orange	A2	
	U	Black	J	J	Black & White	J	C	Brown	C	Yellow	S1	
	D	Brown	K	K	Brown & White	K	D	Brown	D	Yellow, Blue	S2,F2	
	C	Black	L	L	Black & White	L	E	White	E	Blue	F1	
INDICATOR UNIT J3 (AUXILIARY)	A	White	M	M	Black & White	M	F	Black	F	Gray	R1	SYNCHRO
	C	Brown	N	N	Black & White	N	G	White	G	White	R2	
	D	White	O	O	White	O	H	Black	H	Red	S1	
	H	White	R	R	White	R	I	White	I	Orange	S2	
	E	Black	S	S	Brown & White	S	J	Black	J	Brown	S3	

* Limit Switches shorted-"G" & "K" jumpered to "L"

SYNCHRO SELECTOR PANEL

A switching panel has been incorporated in the "control-indicator" rack to allow the operator to select (a) the appropriate coordinate and (b) the appropriate recorder, without having to make any connection changes. Also mounted on this panel is the heater lamp switch and a monitor ammeter. Since the Polar and Rectangular recorders made by S.A. already have their own source of R1 and R2 AC voltage, it was necessary to take only the S1-S2-S3 information from the back of the Indicator unit, ("to recorder" - P1,P2,P3) and feed to the switching network. As S3 was made common in both the 36:1 and 1:1 systems, there were 3 sets of five conductors to switch: S information from each of the cart turntable, horn rotator and tower spindle. A three wafer rotary switch enables the operator to select synchro information from the range coordinate in use. This switched information is routed to a second 3 wafer rotary switch where the choice of rectangular or polar recorder may be made. See Figure #3.

SYNCHRO INFORMATION SWITCHING ARRANGEMENT BETWEEN INDICATORS AND RECORDERS

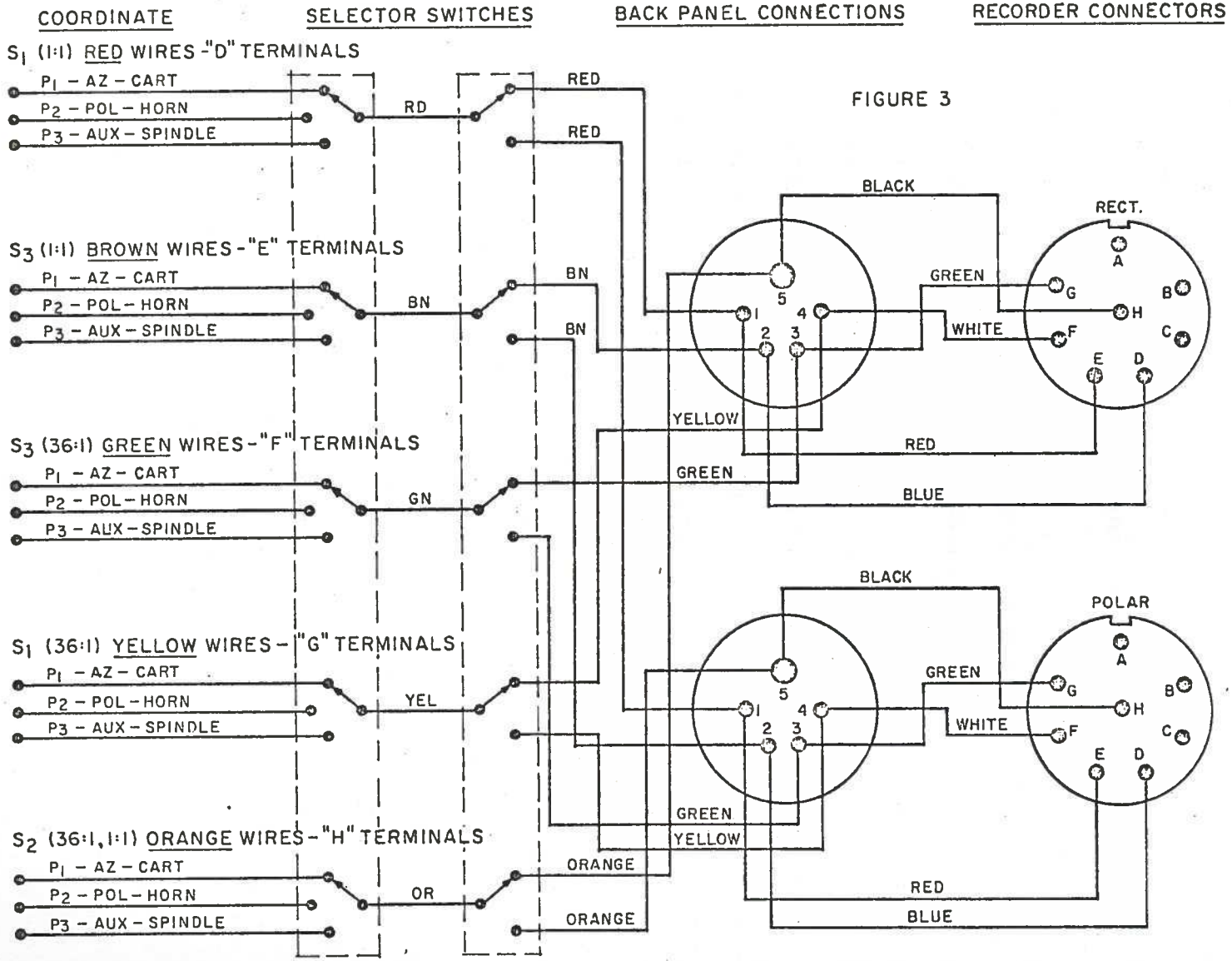


FIGURE 3

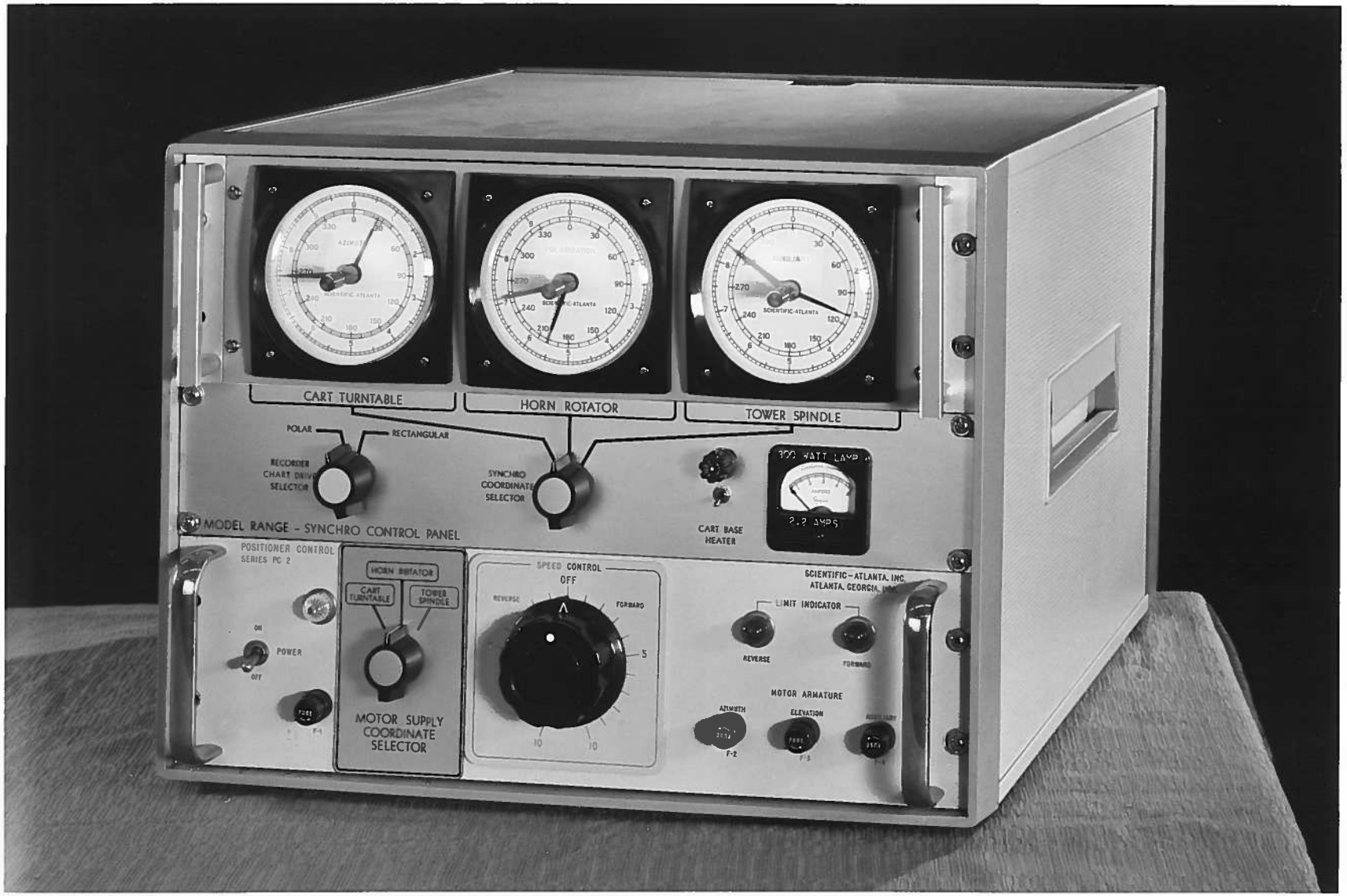
REFERENCES

1. Sinclair Radio Labs - "The S.R.L. Model Aircraft Range Antenna System", April 1953; "SRL Model Tower Type 10A", July 1952; "SRL Horn Antenna Rotator Type 20A1", October 1953.

2. Scientific Atlanta - "Positioner Control Unit, Model P.C. 2-33" - Instruction Manual.

3. Scientific Atlanta - "Indication Units and Panels - Series 4400 - Instruction Manual.

4. Scientific Atlanta - Rectangular Coordinate Pattern Recorder, Series APR20 and Polar Coordinate Pattern Recorder, Series APR30 - Instruction Manuals.



AIRCRAFT RANGE CONTROL RACK WITH
INDICATOR, SYNCHRO, AND POSITIONER PANELS