Operators Manual
for
Model 5330
Resolver/Synchro
Simulator

1. In section 1, Table 1-2 (Specifications), add the following caution just below the table heading:

Item	Specification
CAUTION ALL INPUT/OUTPUT BINDING POSTS ARE PROTECTED FROM ELECTRO-STATIC DISCHARGE BY TRANSIENT SUPPRESSION DEVICES CONNECTED TO CHASSIS GROUND. APPLICATION OF ANY VOLTAGE GREATER THAN 130 Vrms (183 V peak) TO CHASSIS GROUND WILL RESULT IN DAMAGE TO THE INSTRUMENT. **NOTE:** CORRESPONDING REAR PANEL CONNECTORS HAVE THE SAME INPUT RESTRICTIONS.	

2. In section 3, paragraph 3-3, add the following caution just below the paragraph heading:

CAUTION

ALL INPUT/OUTPUT BINDING POSTS ARE PROTECTED FROM ELECTRO-STATIC DISCHARGE BY TRANSIENT SUPPRESSION DEVICES CONNECTED TO CHASSIS GROUND. APPLICATION OF ANY VOLTAGE GREATER THAN 130 Vrms (183 V peak) TO CHASSIS GROUND WILL RESULT IN DAMAGE TO THE INSTRUMENT. **NOTE:** CORRESPONDING REAR PANEL CONNECTORS HAVE THE SAME INPUT RESTRICTIONS.

3. In section 3, paragraph 3-4.3, add sub-paragraph d as shown below sub-paragraph c.

   d. Each time the ENTER key is pressed the output will be updated to the value currently set on the lever switches

ADDENDUM TO NORTH ATLANTIC OM 6010
RESOLVER/SYNCHRO SIMULATOR

This addendum is for Model 5330 units which are to be used as replacements for ILC Data Device Corporation Model SIM31200 and contain optional pin-out for the rear panel 50-pin D-subminiature connector, J3.

1. In Section 3, replace Table 3-3 with the following information:

Table 3-3. J3 Pin Designations

Pin	Signal Name	Function
1-2	SPARE	Do Not Use
3	CASE GND	Chassis (Earth) Ground
4-17	SPARE	Do Not Use
18	REF HI 115V	115 V Reference Input
19	REF LO	Reference Low Input
20	REF HI 26V	26 V Reference Input
21-33	SPARE	Do Not Use
34	S2	Synchro/Resolver Output
35	S3	Synchro/Resolver Output
36	S4	Synchro/Resolver Output
37	S1	Synchro/Resolver Output
38-50	SPARE	Do Not Use

STATUS OF PUBLICATION

Publication No. OM-I-6010

This manual applies to all units labeled with the model number 5330. The identification label is located on the rear panel.

Original	-	May 24, 1996
Change 1	-	January 31, 1997
Change 2	-	May 27, 1998

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF ILLUSTRATIONS

LIST OF TABLES

WARNING

SAFETY SUMMARY

GENERAL SAFETY NOTICES

The following general safety notices supplement the specific warnings and cautions appearing elsewhere in this manual. They are recommended precautions that must be understood and applied during operation and maintenance of the equipment covered herein.

DO NOT REPAIR OR ADJUST ALONE

Under no circumstances should repair or adjustment of energized equipment be attempted alone. The immediate presence of someone capable of rendering aid is required.

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT

DEATH ON CONTACT may result if personnel fail to observe safety precautions. Learn the areas containing high voltage on this equipment. Be careful not to contact high-voltage connections when installing, operating, or maintaining this equipment.

INFORMATION FOR UNITS SOLD WITHIN THE EUROPEAN UNION

GENERAL

Information contained within the following paragraphs supplements and in some cases supersedes information contained throughout this Manual. Where there is a conflict between information contained in these paragraphs and information contained elsewhere in the manual, these paragraphs take precedence for units sold within the European Union.

SPECIFICATIONS

Add to the list of specifications the following information:

Environmental	
Temperature, operating	0° to 70° C, standard
Temperature, non-operating	-55° to 75° C
Relative Humidity	95%, non condensing
Altitude	3050 Meters operating, 12,000 Meters non-operating
Overvoltage/Installation Category	Category II
Pollution Degree	Degree 1
Fuses	115V operation - 0.50 amp. SLO-BLO 230V operation - 0.25 amp. SLO-BLO

LINE CORD

The model 5330 is normally shipped with a UL approved detachable line cord. This line cord does not meet safety requirements of the European Community and should be discarded and replaced with a properly approved type for applications within the European Community.

INSTALLATION AND MAINS INPUT

The model 5330 is designed for bench top or permanent rack-mount installation. An IEC-320 appliance coupler is provided for mains power input. When power is applied through the IEC-320 power input, safety (earth) ground is provided through this power input and the detachable line cord provides the required means of disconnection

SAFETY GROUNDING

For safety from electrical shock and fire in bench-top applications, the unit must be connected to Safety (Earth) ground through the power cord.

IMPROPER USAGE

If the equipment is installed or used in a manner not specified safety may be impaired.

MAINTENANCE

The OPERATOR only has access to the exterior of the unit. All maintenance, including any procedures that require removal of covers, must be referred to qualified Maintenance personnel.

TECHNICAL ASSISTANCE

Contact your local Sales Representative for any technical assistance. Alternately, contact the Factory at:

North Atlantic Industries
170 Wilbur Place
Bohemia, NY 11716 USA

Telephone: **(631) 567-1100**
Fax: **(631) 567-1823**
Email: **sales@naii.com**
Web site: **www.naii.com**

SECTION 1

GENERAL INFORMATION

1-1 INTRODUCTION

This manual provides the operation instructions for the Model 5330 Synchro/Resolver Simulator shown in figure 1-1, hereinafter referred to as Model 5330. Operation information is presented in the following seven sections.

1-1.1 General Information. This section describes the purpose and gives a physical description of the Model 5330. Included in this section are Model 5330 specifications and special tools and test equipment required for checkout of the Model 5330.

1-1.2 Theory of Operation. This section includes an overall block diagram discussion of the Model 5330; a systems software discussion, Model 5330 functional circuit interrelationships and a circuit board description.

1-1.3 Installation and Front Panel Operation. This section contains installation instructions and information for interfacing the Model 5330 with external systems. It includes Simulator operation instructions.

1-1.4 Remote Interface and Standard Programming. This section describes remote control interface to the Model 5330 using the standard interface programming language which conforms to MATE/CIIL (Modular Automatic Test Equipment/Control Interface Intermediate Language) interface specifications. It includes programming commands and data input/output formats.

1-1.5 Optional Language Programming. This section describes remote control interface to the Model 5330 using optional interface languages to facilitate replacement of similar products from other vendors.. It includes programming commands, and data input/output formats.

1-1.6 Performance Checkout and Calibration. This section includes a schedule for periodic Model 5330 performance checkout, performance test procedures, and calibration and adjustment procedures. Test setup diagrams are also included.

1-1.7 Update Information. This section provides Product Revision Sheet (PRS) data which updates the Model 5330 to the latest configuration available.

1-2 PURPOSE

The Model 5330 Simulator is a precision digital-to-synchro/reslover simulator with both static and rotating angle capability. This instrument converts 6 decade BCD data into 3-wire synchro of 4-wire resolver output voltages. This model will operate under LOCAL front panel control or from REMOTE IEEE-488 interface control

Typical applications include synchro or resolver alignment, gyro testing, fire control system testing, and servo system alignment.

1-3 PHYSICAL DESCRIPTION

The Model 5330 is packaged as shown in figure 1-1.

The Model 5330 is a small lightweight unit designed for rack (9 ½ inch half-rack) mounting or for use as a bench top instrument. The panel height is 3 ½ inch nominal. This instrument accepts setup information from front panel lever and key switches or via the IEEE-488 general purpose interface bus. The front panel contains the following:

a. Control Keypad with indicator LED's
b. Lever switches for input of angle or velocity data
c. Reference input 5-way binding posts.
d. Simulator output 5-way binding posts.
e. Numeric digital display (available as special option only).
f. Power switch

The rear panel contains the following;

a. 9-pin D-subminiature input/output connector.
b. 50-pin D-subminiature input/output connector.
c. IEEE-488 standard interface connector.
d. IEEE-488 bus address switch.
e. IEC standard power input connector with integral fuse holder.
f. Chassis/Circuit ground terminal strip.

A complete description of the function and use of these controls, indicators and connections is provided in Section 3. The Model 5330 outline dimensions are shown in figure 1-2.

1-4 FEATURES AND OPTIONS

The Model 5330 is available with 2 standard options as shown below. Consult factory for other special options.. To determine features and options, a single digit number is assigned in accordance with table 1-1.

For example, a Model 5330 for operation form 360 Hz to 10 KHz would have a feature/option number of 5330-F1.

VXI 5330-F [1]

F1

5330-F1

Table 1-1. Features and Options

Feature		Option
No.	Description	
F1	Frequency	1. 360 Hz to 10 KHz 2. 47 Hz to 1000 Hz

1-5 REFERENCE DOCUMENTS

Recommended reference documents for use with the Model 5330 include:

a. MATE Control Interface Intermediate Language - Standard 2806763, Revision C

b. MOD 1 - MATE User's Group Action Traveler - CIIL Definitions.

c. ANSI/IEEE-488.1-1987 - IEEE Standard Digital Interface for Programmable Instrumentation.

1-6 SPECIFICATIONS

The technical features and capabilities of the Model 5330 Simulator are compiled in specification table 1-2.

1-7 SPECIAL TOOLS AND TEST EQUIPMENT

Table 1-3 lists the special tools and standard test equipment required to maintain the Model 5330. The equipment listed or equivalents may be used.

1-8 ACCESSORIES

The Model 5330 can be ordered with mounting adapters for mounting either one or two units in a standard 19-inch equipment rack. Table 1-4 describes full rack and tandem full rack mounting accessories.

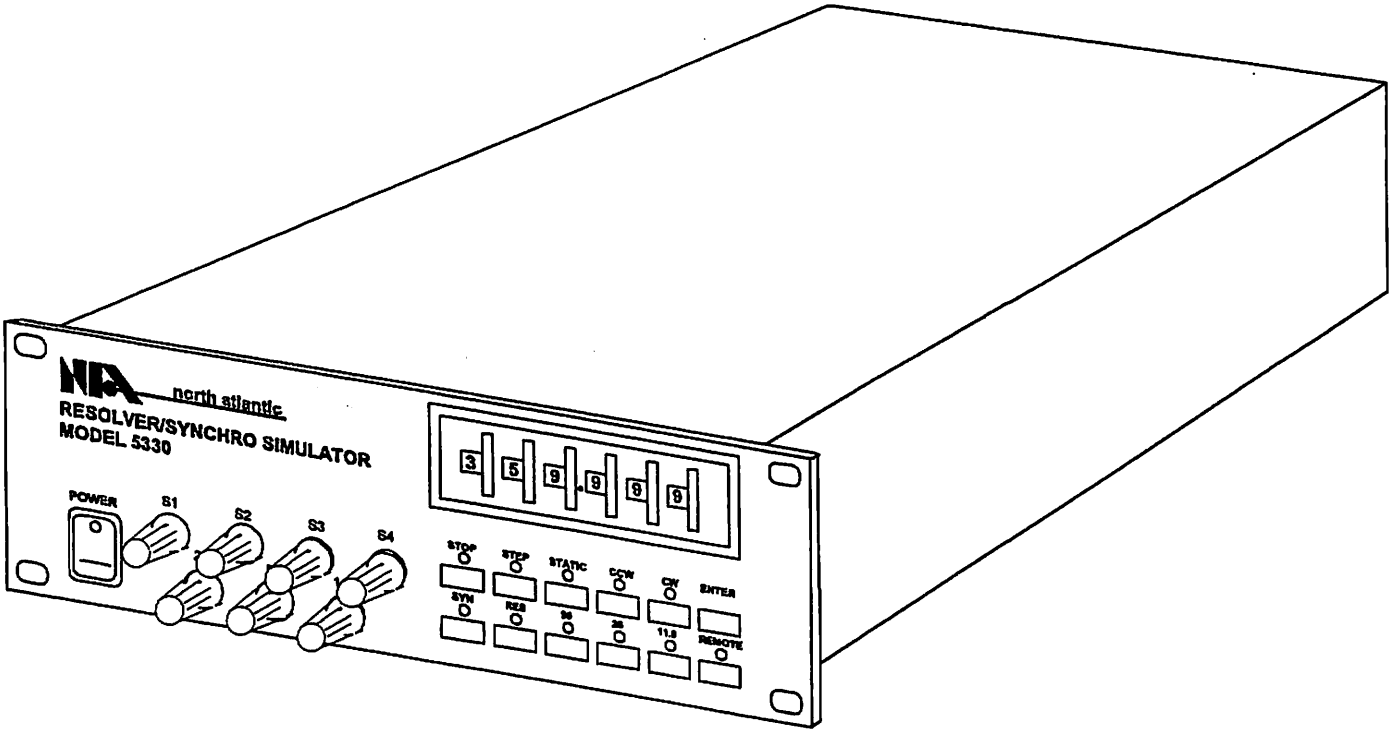


Figure 1-1. Model 5330

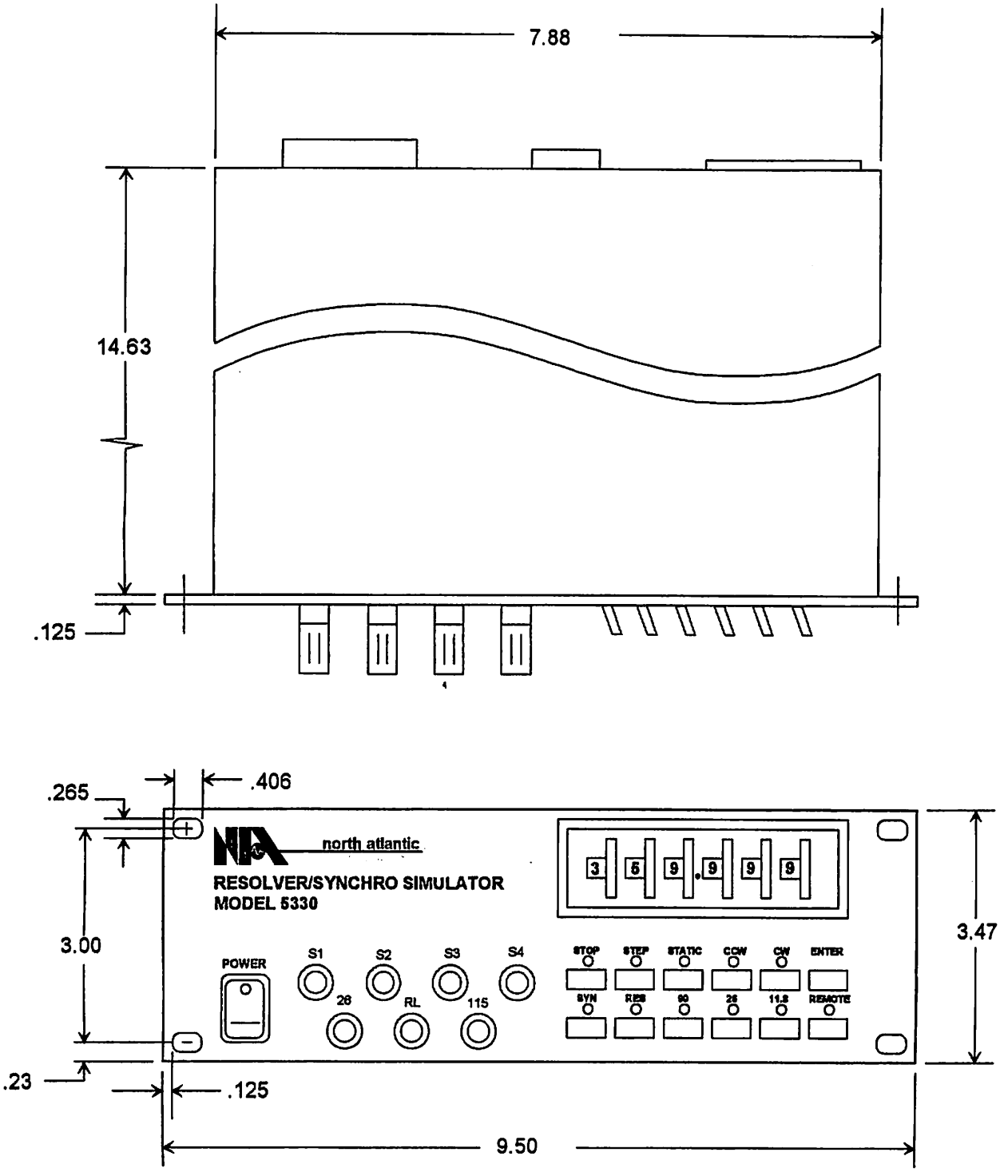


Figure 1-2. Outline Diagram

Table 1-2. Specifications (@ 25°C 5°C)

Item	Specification
SIGNAL	
Accuracy*	**No Load** **Load Error****
-F2 60 Hz to 1,000 Hz	+/- 0.003° 0.003°/VA
47 Hz to <60 Hz	+/- 0.025° 0.003°/VA
-F1 360 Hz to 2,000 Hz	+/- 0.003° 0.003°/VA
10,000 Hz	+/-0.015° 0.015°/VA
	*Accuracy degrades as a linear function of frequency from 2 KHz to 10 KHz. **Balanced 80° phase angle load.
Resolution	0.001°
Velocity	CW or CCW from 0.5° to 12,600°/second with 0.01° resolution
Output Format	Synchro or Resolver, transformer isolated
Output Voltage	Programmable for 11.8/26/90 V_{L-L} Output voltage tracks reference input.
Minimum L-L Load Impedance	**90 V_{L-L}** **26 V_{L-L}** **11.8 V_{L-L}**
Synchro (47-2000 Hz)	2025Ω (3 VA) ------ 35Ω (3 VA)
Resolver (47-2000 Hz)	2700Ω (3 VA) 225 Ω (3 VA) 35Ω (3 VA)
Resolver (2-11 KHz)	------ ------ 93Ω (3 VA)
REFERENCE	
Reference Input	26 Vrms or 115 Vrms
Reference Frequency	See Part Number (Option) Designation
Reference Current	2.5 MA max.
GENERAL	
Angle Range	000.000° to 359.999°
Magnitude Variation	0.03%
Settling Time	Less than 100 µS
Front Panel Controls	
Power On/Off	Main Power Control
Lamp Test	All LED's light at power-up
Remote	Indicator lights when remote. Press key to go to LOCAL
Input Angle Selector	6 lever switches, one per decade.. Sets static angles or velocity.
Static/CW/CCW	Selects either discrete angle inputs or direction of rotation
Enter	Starts rotation and changes angle in STEP mode.
Stop	Stops rotation.
Step	In STATIC mode, output follows input changes immediately. In STEP mode, output will change only when ENTER switch is pressed.

Table 1-2. Specifications (continued)

Item	Specification
Input Power	110/220 Vrms +/-10%, 50/400 Hz, transformer isolated. (35 VA)
Operating Temperature	0°C to +70°C
Dimensions	9.5" x 3.47" (panel) x 14.63" (standard half-rack mountable) Supplied with feet and bail stand.
Weight	16 lbs.
Accessories	19" rack mount ears (optional)
Controller Interface	IEEE-488. Mating cable and connectors not supplied.
Connectors	Front Panel: 5-way Binding Posts Rear Panel: 9 Pin D-Subminature male 50 pin D-Subminature male

Table 1-3. Special Tools and Test Equipment

Equipment	Minimum Use/Critical Specifications	Manufacturer & Model No.
Resolver-Synchro Bridge		North Atlantic Instruments, Models 540/10 and 540/20
Phase Angle Voltmeter	Frequency: 47 - 10 kHz Sensitivity: 0.003 V to 100 V Voltage Accuracy: ±0.2% full scale Phase Accuracy: ±0.1°	North Atlantic Instruments, 2250 Phase Angle Voltmeter
Oscillator (Variable Signal Source), 90 V, 6 W, 10 k		Krohn-Hite 4000A Oscillator and Krohn-Hite 7500 Amplifier
Computer for IEEE-488 Control	IEEE-488 Controller Function with general purpose I/O communications debug program	IBM PC or Compatible with National Instruments NI-488.2 Controller card, Running IBIC debug program
Oscilloscope		Tektronix 454

Table 1-4. Rack Mounting Adapter Accessories

Type of Mount	Description	NAI P/N
Full Rack Mounting	Mounts one unit in 19-inch rack	783893
Tandem Full Rack Mounting	Mounts two units side by side in 19-inch rack (3-1/2-inch rack height)	548557
Tandem Full Rack Mounting	Mounts two units side by side in 19-inch rack (increases rack height to 7 inches)	787026

SECTION 2

THEORY OF OPERATION

2-1 INTRODUCTION

This section contains theory of operation for the Model 5330 which is discussed using an overall block diagram (figure 2-1).

2-2 OVERALL BLOCK DIAGRAM DISCUSSION

The Model 5330 is a precision Synchro/Resolver simulator contained in a compact bench top or rack mountable package. Transformer output isolation is provided.

Simple front panel controls allow local control for bench top operation. Provision is also made for remote control via the IEEE-488 interface bus.

The Model 5330 consists of 2 major circuit card assemblies and a front panel keyboard/display circuit board.

As shown in figure 2-1, the architecture of the Model 5330 is organized into functional sections and is discussed in the following subparagraphs.

2-2.1. Reference Input. This block consists of a reference input transformer and reference level selection. The reference input transformer scales the applied reference voltage to about 5 Vrms and provides isolation. Relays are provided to select either the 115 V or 26 V reference input. Switching is also provided to connect front panel reference inputs when the Model 5330 is under local control or rear panel input when under remote control.

2-2.2 Digital-to-Synchro (D/S) Conversion Module. This section is contained within a sealed module that is not field repairable. Internal to this module are multiplying Digital-to-Analog converters (DAC) which transform the reference input into AC voltages proportional to the SINE and COSINE of the programmed angle value. Software angle corrections are also programmed into a correction DAC within this module as needed.

2-2.3 Power Amplifier. Separate SINE and COSINE channel amplifiers step up D/S conversion module output to about 12 Vrms and provide low impedance drive to output transformer section.

2(3)4 Output Transformer. This section provides isolation and the required low impedance output at 11.8 V, 26 V, or 90 V as needed. This transformer consists of a precisely balanced Scott-T transformer set which accomplishes the conversion of 4-wire Resolver data into 3-wire Synchro data as selected by the user.

2-2.5 Output Voltage and Mode Selection. This section consists of relays to select proper output transformer taps for selected line-to-line output voltage. An additional relay makes required connections to Scott-T output transformer for conversion to 3-wire synchro data. Outputs are continuously available at both front panel 5-way binding posts and rear panel connectors.

2-2-6. Angle Data Generation and Calibration. This section consists of high speed read-only-memory (ROM), a field programmable gate array (FPGA), various logic integrated circuits and random-access-memory (RAM). Information from the Microprocessor section is used to generate addresses and controls to produce proper angle data for the D/S conversion section. The microprocessor also downloads a working calibration correction table into RAM. Once angle generation circuits are setup, they run independently, and therefore are capable of high speed angle rotation.

2-2.7. Microprocessor Section. This section consists of a microcontroller type microprocessor (Intel 8031) with internal timer, external RAM, ROM and electrically-erasable programmable read-only memory (EEPROM). Embedded program for operation of the Model 5330 is contained in ROM. Volatile variables used during program execution are contained in RAM. Calibration data is stored in non-volatile EEPROM.

During normal operation, the microprocessor monitors front panel controls and the IEEE-488 remote control interface for setup parameters. When a new angle value, rotation or step value is input, the hardware is set to provide the proper simulated Synchro/Resolver output. When a line-to-line voltage or SYN/RSVR mode value is selected, a new working calibration table is generated and the hardware is updated accordingly. A change of applied reference frequency will also prompt generation of a new working calibration table. Generation of a new working calibration table may take several seconds and the output is not valid until this has been completed.

2-2.8 Front Panel Controls and Displays. This section consists of a 6 decade lever switch which produces binary-coded decimal (BCD) data equal to the desired angle or

rotation value to the microprocessor. Function key switches are polled by the microprocessor and provide input of mode, line-to-line voltage and rotation status information. All key switches except ENTER have status indicator LED's. These LED's are connected to an output port from the microprocessor and give visual feedback of parameters selected. Provision is made for an optional 7-segment LED display which will indicate programmed angle value, rotation rate, or rotated angle value.

2-2.9 IEEE-488 Remote Interface. The remote interface provides for remote setup and calibration of the Model 5330. This section consists of a custom FPGA and 2 bus interface drivers. All required handshake and protocol is handled by the custom FPGA. This device is directly read and written by the microprocessor.

2-2.10. Power Supplies. Linear power supplies are used to prevent unwanted noise. Operatation is possible at 115 or 230 Vac with proper setup. The power supplies produce +/-24 Vdc, +/- 15 Vdc, +5 Vdc, and +12 Vdc for proper system operation.

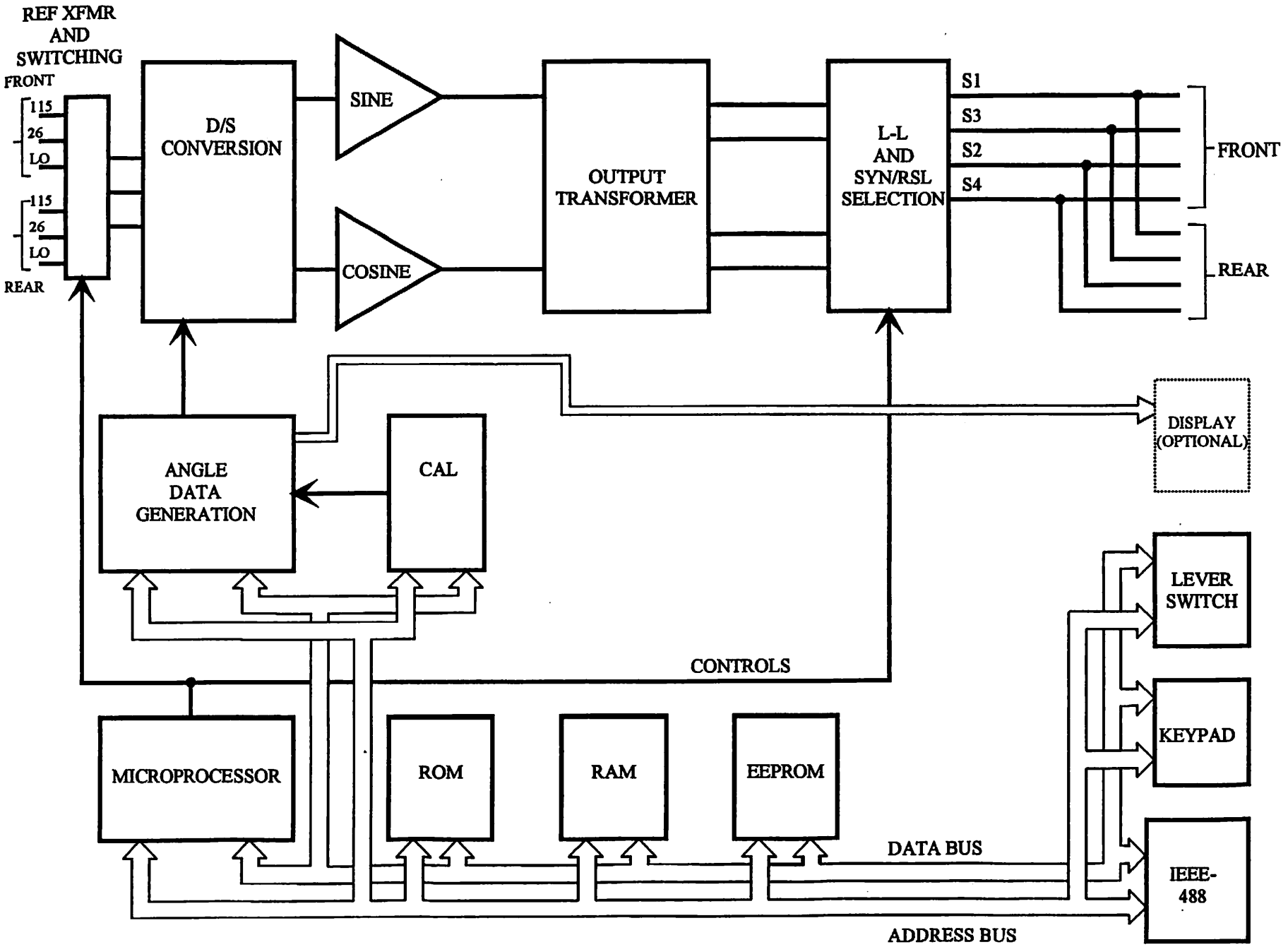


Figure 2-1. Model 5330, Overall Block Diagram

SECTION 3

INSTALLATION AND FRONT PANEL OPERATION

3-1 INTRODUCTION

This section describes the installation, and manual bench-top operation of the Model 5330 Synchro/Resolver simulator..

3-2 UNPACKING AND INSPECTION

The Model 5330 has been thoroughly tested, inspected, and evaluated at the factory. Care has been taken in the design of the wrapping and packaging material to insure that no damage results from mishandling.

a. Remove the unit from the shipping container. Save container for future use in storing or shipping.
b. Visually check the contents of the shipping container against the shipping list.
c. Check for damage to unit and notify the carrier if it is damaged.

3-3 INSTALLATION INSTRUCTIONS

The Model 5330 is designed for bench-top operation or mounting in a standard half rack or optional full 19" rack with optional adapters.. No special setup is required prior to operation.

The Model 5330 is shipped from the factory with line voltage input setup for 115 V AC operation and a 1.0 ampere fuse installed. See paragraph 3-3.3 for operation at 230 V AC.

Table 3-1, 3-2 and 3-3 list pin designations for rear panel connectors J1, J2, and J3.

Table 3-1. J1 Pin Designations

Pin	Signal Name	Function
1	SPARE	Do Not Use
2	SPARE	Do Not Use
3	S1	Synchro/Resolver Output
4	S2	Synchro/Resolver Output
5	REF LO	Reference Low Input
6	REF HI 26V	26 V Reference Input
7	S4	Synchro/Resolver Output
8	S3	Synchro/Resolver Output
9	REF HI 115V	115 V Reference Input

NOTE: J1 mating connector: P1, 9-pin, female, D-type connector.

Table 3-2. J2 Pin Designations

Pi	Signal Name	Function
1	DIO1	Data I/O 1
2	DIO2	Data I/O 2
3	DIO3	Data I/O 3
4	DIO4	Data I/O 4
5	EOI	End or Identify
6	DAV	Data Valid
7	NRFD	Not Ready For Data
8	NDAC	Not Data Accepted
9	IFC	Interface Clear
10	SRQ	Service Request
11	ATN	Attention
12	SAFETY GND	Safety Ground
13	DIO5	Data I/O 5
14	DIO6	Data I/O 6
15	DIO7	Data I/O 7
16	DIO8	Data I/O 8
17	REN	Remote Enable
18-24	SIGNAL GND	Signal Ground

NOTE: J2 mating connector: IEEE-488 Standard.

Table 3-3. J3 Pin Designations

Pi	Signal Name	Function
1-2	SPARE	Do Not Use
3	CASE GND	Chassis (Earth) Ground
4-17	SPARE	Do Not Use
18	S2	Synchro/Resolver Output
19	S4	Synchro/Resolver Output
20	REF LO	Reference Low Input
21-33	SPARE	Do Not Use
34	S1	Synchro/Resolver Output
35	S3	Synchro/Resolver Output
36	SPARE	Do Not Use
37	REF HI 115V	115 V Reference Input
38	REF HI 26V	26 V Reference Input
39-50	SPARE	Do Not Use

NOTE: J1 mating connector: P1, 50-pin, female, D-type connector.

3-3.1 Mounting. The Simulator may be mounted on a bench or in a standard half rack, in any physical position. The Model 5330 may be mounted in a standard 19-inch equipment rack when an optional full rack mounting adapter is used (see Table 1-4). .It requires no special cooling equipment. Mount the unit so that air flows freely around it , particularly the right side (as viewed from the front) which is used to transmit heat from the output amplifiers. Figure 3-1 illustrates full and tandem rack mounting. A tandem full rack (two unit) adapter accessory kit is also available, permitting the model 5330 to be mounted together with Model 8810 or 5310.

3-3.1.1 Full (19-inch) Rack Mounting.

a. Refer to Figure 3-1, Mount full rack extender panels to each side of unit using #10-32 x 5/8-inch pan head screws.
b. Mount unit to standard 19-inch equipment rack using four securing screws (not supplied).

3-3.1.2 Tandem Full Rack Mounting (NAI P/N 5i48557).

a. Referring to figure 3-1, establish left and right mounting locations for each instrument.
b. Remove top cover mounting screws from right side of Instrument A and left side of Instrument B.
c. Mount bracket (NAI P/N 299399 w/o PEM) to the right side of Instrument A using #4-40 x 3/8-inch securing screws and lock washers.

NOTE

Make certain larger clearance holes in end of bracket are toward the front.

d. Mount bracket (NAI P/N 299405 w/PEM) to the left side of Instrument B using #4-40 x 3/8-inch screws and lock washers.
e. Join the two instruments together side by side so that the bracket of Instrument B slides inside of the bracket of Instrument A.
f. Secure the front panels of both instruments to the mounting brackets using four #6-32 x 7/16-inch screws and #10-32 lock nuts.
g. Secure rear ends of the brackets together by screwing four #6-32 x 7/16-inch screws into threaded PEM holes.
h. Install the tandem mounted instruments into a standard 19-inch equipment rack using four securing screws (not supplied).

3-3.1.3 Tandem Full Rack Mounting (NAI P/N 787026)

a. Referring to figure 3-1, establish left and right mounting locations for each instrument.
b. Secure channel support bracket to the two angle support rack mounts by screwing six flat head #8-32 x ½-inch screws in threaded PEM holes.
c. Secure both instruments to channel support bracket by screwing four #10-32 x ½-inch screws in threaded PEM holes.
d. Install the tandem mounted instruments into a standard 19-inch equipment rack using twelve securing screws (not supplied).

3-3.2 Grounding. In a high-accuracy Synchro/Resolver Simulator it is necessary for both chassis and signal ground to be tied together. Ground loops should be avoided in system applications. For this reason chassis ground-to-signal ground connection is made accessible to the user. For most setups the rear panel shorting link can be left in place. If it is desired to make the connection between signal and chassis ground at another point in the system to avoid ground loops, the shorting link may be removed and the ground terminals wired for remote connection.

3-3.3 Voltage Selection and Fusing. The Model 5330 is shipped from the factory setup for 115 VAC operation. If it is desired to operate the unit at 230 VAC proceed as follows:

a. Remove the line cord from the rear panel line entry module.
b. Pry open the line entry module at the tab provided to gain access to the fuse and voltage selection drum.
c. Carefully remove the voltage selection drum and rotate it to make "230 Vac" indication face outward.
d. Re-insert voltage selection drum.
e. Remove fuse cassette and replace fuse with a 0.5 ampere 3AG type SLO-BLO fuse. This option fuse came packed with unit in a separate bag.
f. Re-insert fuse cassette and close line entry module.

3-3.4 Simulator Signal Outputs. Outputs S1-S4 are continuously available from both the

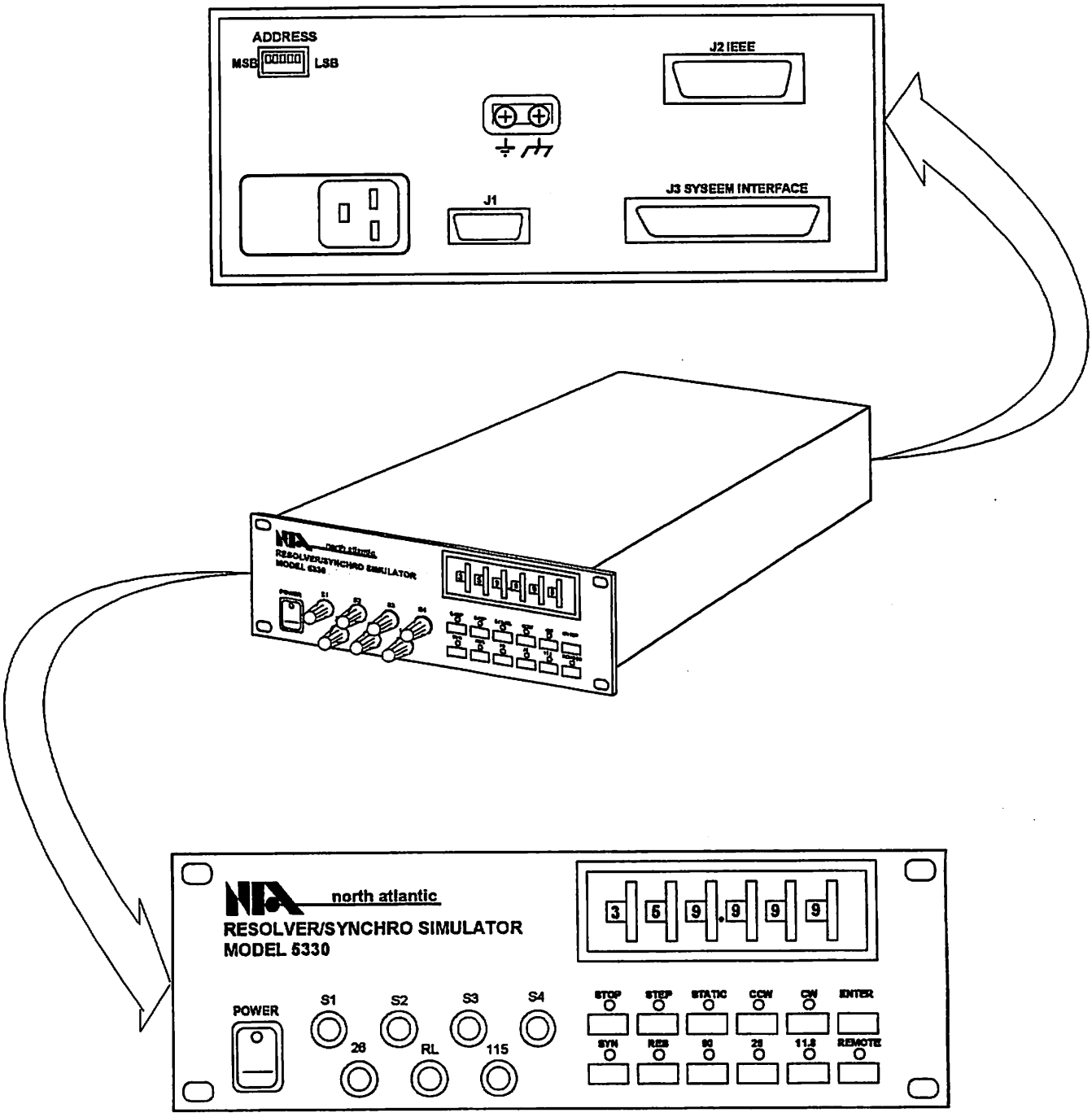


Figure 3-1. Controls and Indicators

front panel 5-way binding posts and the rear panel D-type connectors. For best accuracy under load be sure to use a good quality, low resistance connection for these outputs.

3-3.5 Reference Inputs. Separate inputs are provided for 115V and 26V reference inputs.

CAUTION

Connection should be made to only 1 of the reference inputs at a time. Damage to the reference input transformer may result if both 115V and 26V inputs are connected at same time. There are 2 sets of reference inputs; front panel 5-way binding posts and rear panel D-type connectors. When the Simulator is set for local front panel control the front panel reference inputs are connected. When the unit is under remote control (IEEE-488) the rear panel D-type connectors are used. Remote/Local control status is indicated by the indicator LED above the front panel REMOTE key.

3-4 FRONT PANEL OPERATION

Operation of the Model 5330 under local manual control is accomplished using front panel controls. See sections 4 and 5 for remote controlled operation.

3-4.1 Controls and Indicators. Operation of front panel controls and indicators are as summarized below and illustrated in figure 3-2.

a. Power Switch. When in ON position as indicated by red band on upper edge of switch actuator, unit has AC power applied and is ready for use.
b. 11.8/26/90 Line-to-Line voltage selection keys. Selection of output line-to-line voltage is accomplished by pressing 11.8, 26 or 90 key. Indicator light above key lights to indicate selection. Note: There may be a delay of several seconds between time that key is pressed and time indicator lights. This delay is due to time required for internal calibration values to be calculated and stored.
c. SYN/RSVR Mode selection. Selection of 4-wire Resolver output or 3-wire Synchro output is accomplished by pressing SYN or RSVR key. Indicator above key will light to indicated selection made, Note: There may be a delay of several seconds between time that key is pressed and time indicator lights. This delay is due to time required for internal calibration values to be calculated and stored.
d. STATIC/CW/CCW operation. Default mode of operation is STATIC. In STATIC mode the output angle is equal to the value set on the ANGLE SELECTOR lever switches. CW and CCW select direction of rotation for dynamic angle output. Selection will be shown by indicator LED above key switch.
e. ENTER key. Starts rotation or changes angle in STEP mode.
f. STEP key. In STATIC mode output angle follows lever switch value immediately. In STEP mode, output angle will change only when ENTER key is pressed. LED above key indicates selection made.
g. REMOTE key. Indicator above key lights when unit is under remote control. To activate LOCAL control, press key. If there in no IEEE-488 LOCAL LOCKOUT condition, unit will return to LOCAL control.
h. Input Lever Switches. A 6 decade lever switch provides Angle Input or Velocity. For Angle Input, lever switches may be set to values from 000.000 to 359.999 as needed. For Velocity, lever switches may be set to values from 1 to 12,600 degree/second in 1 degree/second steps. The right digit indicates 1 degree/second.

3-4.2 STATIC Operation. For output of a fixed Synchro/Resolver angle proceed as follows:

a. Apply Reference. Connect either 26V or 115V reference at proper frequency to front panel binding posts. Note: For local operation, rear panel reference inputs are not connected.
b. Select Output Mode. Press either SYN or RSVR key to select 3-wire Synchro or 4-wire Resolver output format.
c. Select Line-to-Line voltage. Press either 11.8, 26 or 90 key to select output line-to-line voltage. Note: Output voltage is scaled to reference. A change of reference voltage from the nominal value will change output line to line voltage.
d. Verify STATIC indicator is lit.
e. Select Output Angle. Use lever switches to set desired output angle.
f. Allow time for internal calibration. Whenever there is a change of Reference input frequency, line-to-line voltage selection, or SYN/RSVR mode selection, the Model 5330 will

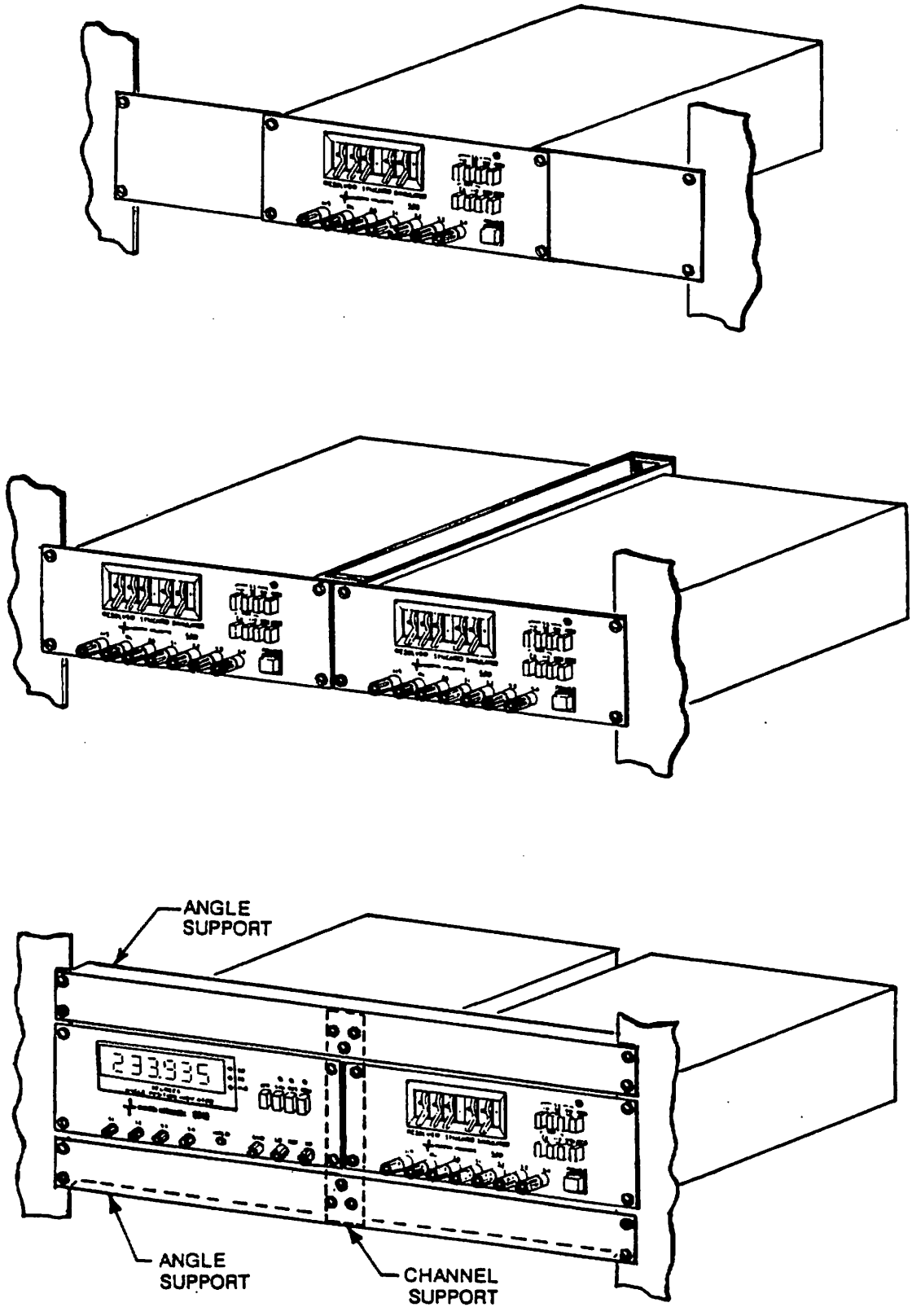


Figure 3-2. Full Rack and Tandem Rack Mounting Adapters

calculate and store new calibration values. This may take several seconds and the output will not be to specified accuracy until this is complete.

3-4.3 STEP operation. Setup unit as shown in paragraph 3-4.3 (STATIC operation) then proceed as follows.

a. Press STEP key. Indicator will light.
b. Set desired Output Angle value with lever switches.
c. Press ENTER key when you wish output to change to new angle value.

3-4.4 CW/CCW Rotation. Setup desired SYN/RSVR mode, line-to-line voltage , reference voltage and frequency as indicated in paragraph 3-4.2 then proceed as follows:

a. Press CW or CCW key for clockwise or counter-clockwise rotation as desired. Clockwise rotation with provide output angles that vary from 0 toward 360 degrees.
b. Set desired rotation rate in degrees per second with lever switch. Rightmost digit indicates 1 degree/second.
c. Press ENTER key to begin rotation at selected rate and direction.
d. To stop rotation press STOP key.

3-4.5 Calibration Update Delay. Whenever reference input frequency changes by more than 10% or there is a change of Synchro/Resolver mode, or line-to-line output voltage, the Model 5330 updates the working calibration table. This update may take up to about 5 seconds. Output accuracy will not be guaranteed until this calibration table update is complete.

SECTION 4

REMOTE INTERFACE AND STANDARD PROGRAMMING

4-1 INTRODUCTION

This section describes the remote operation and programming of the Model 5330 using the IEEE-488 General Purpose Interface Bus and Modular Automatic Test Equipment (MATE) Control Interface Intermediate Language (CIIL) which is standard (NATIVE). Although the Model 5330 uses MATE/CIIL syntax for the standard interface language, full compatibility with MATE specification is not guaranteed.

4-2 IEEE-488 INTERFACE

The following paragraphs describe the function of the IEEE-488.1 1987 Standard Digital Interface for Programmable Instrumentation as applied to the Model 5330.

4-2.1 IEEE-488 Interface Capabilities. Table 4-1 summarizes interface function capabilities for the Model 5330.

Table 4-1. IEEE-488 Interface Functions

Code	Function
AH1	Acceptor Handshake capability
SH1	Complete Source Handshake capability
T6	Basic Talker capability, Serial Poll, Unaddress if MLA
L2	Basic Listen capability
SR0*	No Service Request Capability
RL1	Remote-Local capability
PP0	No Parallel capability
DC1	Device Clear capability
DT0*	No Device Trigger capability

* These functions only available when optional language is enabled

4-2.2 Address Switch. The rear panel of the Model 5330 contains a 5-position DIP switch for setting the IEE-488 bus address of the device. The switch is continuously monitored by the control microprocessor in the Model 5330 and changes to this switch may be done with device power on.

The switch is configured as binary value of basic bus address, least significant on right as viewed from the rear panel. For each switch actuator, the UP position represents a binary 1 value for that bit position.

For example:

The following represents address 5

DN	DN	UP	DN	UP
0	0	1	0	1

4-2.3 Remote Status Indicator. When the Model 5330 is under remote control, the LED above front panel REMOTE key switch will light. Pressing the REMOTE key when under remote control will cause the Model 5330 to return to LOCAL control unless the IEEE-488 bus controller has sent LOCAL LOCKOUT bus command.

4-3 MATE/CIIL FUNCTIONS

The CIIL language allows the Model 5330 to communicate with the MATE controller and powers-up in the *MATE/CIIL* mode unless alternate language has been activated (see sections 5).

4-3.1 MATE Functions Provided. The following functions are provided:

a. Accepts control computer input and translates the standard program instructions of the MATE Control Interface Intermediate Language (CIIL) into that required by the Model 5330.

b. Provides the means to perform Confidence and Self-Test procedures.

c. Generates status messages.

4-3.2 Reference Documents. Recommended reference documents for use with this option include:

a. MATE Control Interface Intermediate Language - Standard 2806763, Rev. C.

b. MOD 1 - MATE User's Group Action Traveler
- CIIL Definitions.

c. NATIVE Command Language for NAI Model 5330.

d. Measurement time-outs

4-4 SIM MATE/CIIL PROGRAMMING

The following describes the operation and MATE/CIIL programming of the Model 5330 synchro/resolver simulator.

The following notation in table 4-2 shall be used to describe various input and output strings.

Table 4-2. Elemental Notation

Notation	Description
|	Exclusive OR
<>	The boundaries of a field or structure of inseparable items.
<b>	One ASCII blank
[ ]	An optional field, item, or structure.
...	The field or structure may be repeated as often as required.
<cr><lf>	ASCII encoded carriage return followed by line feed.
<setcode>	SET | SRX | SRN
<noun>	SYN or RSL
<modifier>	Four ASCII encoded characters. See table 4-6 for a complete list.
<chan num>	1 or 2 digit number indicating the channel number.
<value>	Any ASCII encoded number in floating point, engineering, or integer notation.

4-4.1 Inputs. There are seven input transmission types applicable to the Model 5330 in the CIIL language. At the start of each type the instrument will be *listen addressed* by the control computer. The end of the transmission will be indicated by **<cr><lf>**. Each transmission type begins with its own characteristic *<verb>*. They are as follows:

FNC	Setup the instrument
CLS	Close the output path
OPN	Open the output path
RST	Reset the instrument
STA	Report status
IST	Initiate built-in-test
CNF	Initiate confidence test

As a general rule, anywhere one **<b>** (blank) is indicated, the Model 5330 will accept multiple blanks as if they were one blank.

4-4.1.1 Format of FNC. The FNC string is used to set up the instrument. The general format of the FNC string is:

FNC<b>*<noun>***<b>:CH***<chan num>*

[<b>*<setcode>***<b>***<modifier>***<b>***<value>***]...<cr><lf>**

where:

<noun> Defines the type of signal to be generated:

SYN - selects synchro
RSL - selects resolver

If any other *<noun>* appears an error message will be generated.

<chan num> Specifies the input channel. The *<chan num>* must be specified as *0* or *00*.

<set code> Defined as the ASCII sequences of SRX, SET, or SRN. Modifiers associated with SET will be used by the Model 5330. SRX and SRN will be accepted without error but are not preferred for setup of the Model 5330.

<modifier> Modifiers program features of the Model 5330. Modifiers are checked to verify that they are within the capabilities of the unit. The modifiers recognized by the Model 5330 are:

Modifier	Description
ANGL	angle
ANRT	angle rate
REFV	reference voltage
VOLT	output L-L voltage
FREQ	frequency
CALA	calibration
CALZ	clear all calibration
ANGP	angle step size
INCC	increment CCW
INCW	increment CW

REFV and FREQ modifiers will be accepted without error but will have no effect on setup of the Model 5330. Any setup message sent to the Model 5330 must contain at least one modifier that sets a valid setup parameter.

If any other modifiers appear an error message will be generated.

[value] This is an ASCII encoded number in floating point, engineering, or integer notation. The value following all <*modifier*> fields is checked to insure that it is within the limits given as follows:

47	≤	FREQ	≤ 10000
-12600	≤	ANRT	≤ 12600
0	≤	ANGL	≤ 359.999
		VOLT	=11.8|26|90
	≤	REFV	=26|115
-0.063	≤	CALA	≤ 0.063
0.10	≤	ANGP	≤ 359.999

4-4.1.2 Format of CLS. The format of the CLS message can be either of the following:

CLS<b>:CH*0*<cr><lf> or **CLS<b>:CH*00*<cr><lf>**

The Model 5330 does not contain output isolation relays but will accept the CLS command without error.

4-4.1.3 Format of OPN. The format of the OPN string can be either of the following:

OPN<b>:CH*0*<cr><lf> or **OPN<b>:CH*00*<cr><lf>**

The Model 5330 does not contain output isolation relays but will accept the OPN command without error.

4-4.1.4 Format of RST. The RST command causes the Model 5330 to reset to the initial power-up state. The format of RST is:

RST<b><*noun*>**<b>:CH**<*chan num*>**<cr><lf>**

The <*noun*> must match the <*noun*> in the previous FNC message or this command will be ignored.

The Model 5330 will be reset to the power-up default conditions as follows:

Mode	Synchro
L-L Voltage	11.8
Angle	0.000
Angle Rate	0

4-4.1.5 Format of STA. The STA command instructs the Model 5330 to return the status of the instrument. The format of this command is:

STA<cr><lf>

4-4.1.6 Format of IST. The IST command instructs the Model 5330 to perform an Internal Self-Test procedure. After the test is completed the result can be obtained using the STA command. No messages are allowed to be sent to the Model 5330 while the test is in progress or an error message will be generated. The format of the IST is:

IST<cr><lf>

IST time is 1 second.

4-4.1.7 Format of CNF. The CNF command instructs the Model 5330 to perform a confidence test. The format of the CNF is:

CNF<cr><lf>

CNF time is 1 second.

4-4.2 Outputs

4-4.2.1 Response to STA. The response to STA will be either:

<b><cr><lf> or an error message

STA is typically used after the unit is setup to determine if it was programmed properly, and also after a CNF or IST. The **<b><cr><lf>** message indicates no errors were found.

4-4.2.2 Errors. Error messages are generated for the following basic reasons:

a. Syntax errors
b. Values out-of-range
c. Failure of CNF or IST

Once an error is loaded into the output buffer it will remain there until it is read by the control computer, or until an RST or DCL command is issued. Error messages have the following form:

F07SRS00 (MOD): <*ASCII message*>**<cr><lf>**

See table 4-4 for explanation of error messages.

Table 4-3. SIM CIIL Codes

CIIL	Description
<verbs>:	
FNC	function
OPN	open
CLS	close
STA	status
RST	reset
CNF	confidence test
IST	BIT test
<setcodes>:	
SET	set
SRX	set maximum
SRN	set minimum
<nouns>:	
SYN	synchro
RSL	resolver
<modifiers>:	
ANGL	angle
ANRT	angle rate
REFV	reference voltage
VOLT	voltage
FREQ	frequency
CALA	calibration
CALZ	clear all calibration
ANGP	angle step size
INCW	increment clockwise
INCC	increment counter-clockwise

NOTE

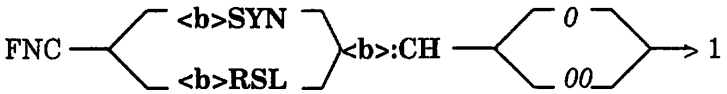
Whenever frequency of applied reference changes by more than 10% or there is a change of setup of Synchro/Resolver mode or line-to-line voltage, the Model 5330 builds a new calibration working table. This may take up to about 5 seconds. During this time output angle may not be valid. Also, communication over the IEE-488 bus may be held off.

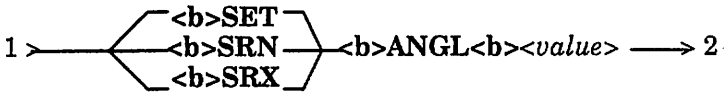
Table 4-4. Error Message Format.

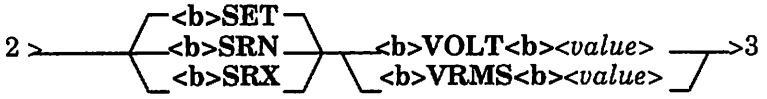
ERROR MESSAGES	
FO7SRS00 (MOD): INVALID DATA FIELD	1
FO7SRS00 (MOD): MESSAGE OVERFLOW	2
FO7SRS00 (MOD): SYNTAX ERROR	3
FO7SRS00 (MOD): INVALID SEQUENCE	4
FO7SRS00 (MOD): DATA RANGE ERROR	5
FO7SRS00 (MOD): INVALID INX-FTH SEQUENCE	6
FO7SRS00 (MOD): MODIFIER MISMATCH	7
FO7SRS00 (MOD): NO SPACE	8
FO7SRS00 (MOD): R/D BIT NOT READY	9
FO7SRS00 (MOD): BIT FAIL DEG.	10
FO7SRS00 (MOD): ERROR IN EXPONENT RANGE	11
FO7SRS00 (MOD): INDICATES LOSS OF INPUT SIGNAL	12
FO7SRS00 (MOD): NO CARRIAGE RETURN	13
FO7SRS00 (MOD): INVALID MESSAGE COMMAND	14
FO7SRS00 (MOD): CHANNEL NUMBER ERROR	15
FO7SRS00 (MOD): SET CODE ERROR	16
FO7SRS00 (MOD): MODIFIER ERROR	17
FO7SRS00 (MOD): NOUN ERROR	18

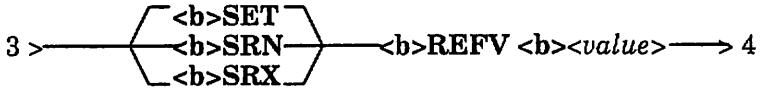
4-5 MODEL 5330 CIIL RAILROAD DIAGRAMS

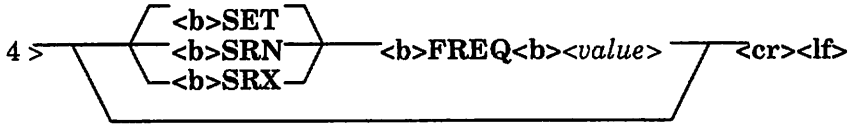
The following are typical CIIL Railroad Diagrams which are used for programming the Model 5330 SIM.

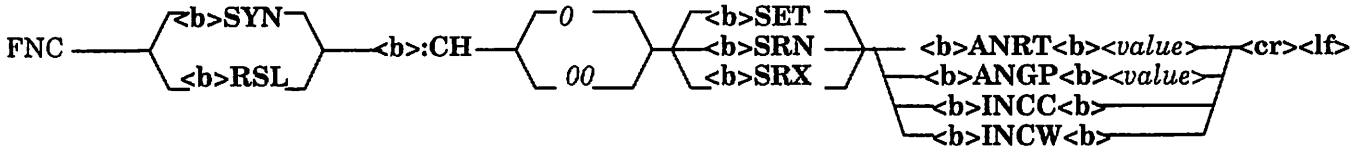


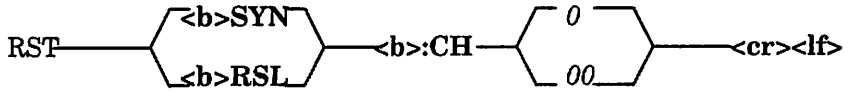


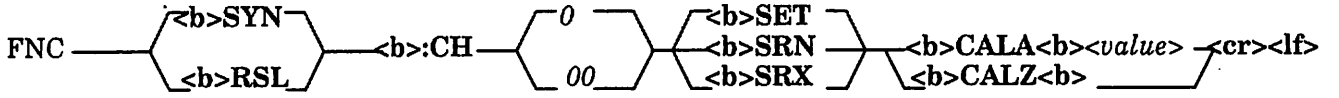












NOTE

Range of <value>

VOLT	=		<value> (V)	=	11.8 | 26 | 90
REFV	=		<value> (V)	=	26 | 115
FREQ	=	47	≤ <value> (Hz)	≤	10000
ANRT	=	-12600	≤ <value> (Deg/Sec)	≤	12600
ANGL	=	0	≤ <value> (Deg)	≤	359.999
CALA	=	-0.063	≤ <value> (Deg)	≤	0.063
CALZ	=	none			
ANGP	=	0.10	≤ <value> (Deg)	≤	359.990
INCC	=	none			
INCW	=	none			

SECTION 5

OPTIONAL LANGUAGE PROGRAMMING

5-1 INTRODUCTION

This section describes the operation and programming of the Model 5330 using optional emulation of North Atlantic Model 5310 or ILC Data Device Corp. Model SIM-31200. The Model 5330 may be configured to emulate the interface language of these products. Once configured, the Model 5330 will power up with selected language emulation activated.

5-2 OPTIONAL LANGUAGE SELECTION

Language emulation option is set at the factory prior to shipment. Standard MATE language may be temporarily activated with an IEEE-488 command string as shown in Table 5-1 below.

Table 5-1. Language Emulation Commands

Model	Emulation Command String
5330	Set at Factory
5330 TEMP*	LANG<sp>TMATE<cr><lf>
5310	Set at Factory
31200	Set at Factory

*Temporarily switches to Model 5330 standard MATE language, but returns to previous factory set language emulation at next power up sequence.

5-2.1 Language Query. The present language emulation setting may be queried using the following command:

LANG?<cr><lf>

Response string will be "MATE", "5310", or "31200."

5-3 NORTH ATLANTIC MODEL 5310 EMULATION

In this mode of operation the Model 5330 will accept and execute remote interface commands formatted for the North Atlantic Instruments Model 5310.

5-3.1 Model 5310 Command Syntax. Model 5310 language is summarized in Table 5-2.

Table 5-2. Model 5310 General Programming

Function	Position command character	Pos. No.	Data Character
Input Angle	I N P U T	1 2 3 4 5	BCD Bits 1-2 100s 3-6 10s 7-10 1s 11-14 .1s 15-18 .01s
Mode	M	6	Resolver = 0 Synchro = 1
Reference input level	R	7	115 V = 0 26 V = 1
Output L-L voltage	V	8	11.8 V = 1 26 V = 2 90 V = 3
Group Command (inhibit execution until GET)	G		
Sets Tracking Rate Angle	S		<rate>
Set end angle delimiter	E		<angle>
Message terminator	Line Feed or Carriage Return		

5-3.2 Message Data Format. The following paragraphs provide message data format information.

a. Messages are assumed complete and terminated when any combination of carriage return, line feed and/or EOI are received.
b. Data charters (ASCII Hex, 0-9, A-F) are parsed sequentially as shown in table 5-2. The user has the option of sending just data characters (first character parsed in position 1) or of using one or more positioning characters.
c. The Group command can be located anywhere in a message.
d. Where data position uses less than 4 bits, the unused bits of the data character are ignored.

5-3.3 General Programming. The following steps provide 5310 remote setup and angle programming.

a. After addressing, the Model 5330 is ready to receive bits 1-2. Data can be sent without a position command character if data is presented in correct order.
b. Binary coded decimal (BCD) data is entered directly starting with the 100's (position no. 1), 10's (position no. 2), etc.

   Examples:

   To program 270.000°, send 27000 in ASCII

   To program 22.5°, send 02250 in ASCII

c. Model 5330 is ready to receive mode programming, reference input level programming, and output L-L programming as shown below.

   27000111

   This programs the Model 5330 for 270° synchro, 26 V Reverence, 11.8 V line-to-line.

d. If only one portion of the data is to be change, it can be accessed by the appropriate position command character.

   Sending the character M, positions the Model 5330 to receive mode programming data. After the mode programming character is received, the Model 5330 is positioned to receive REF level programming.

   In summary, the data receiving sequence can be entered at any point by sending the appropriate position character.

e. Line Feed, Carriage Return and/or EOI must be used to terminate each message received by the IEEE-488 interface.
f. Sending the character G, indicates to the Mode 5330 to wait for Group Execute Trigger (GET) command before executing programmed setup.
g. Upon power-on, Device Clear and Selected Device Clear, the unit will be in the following state:
   Synchro, 11.8 V L-L, angle set to 0°.

5-3.4 Rate and Triangle Wave Modes. The Model 5330 can emulate the Model 5310 but angle rate programming has different limits and Triangle mode is not supported.

The Model 5330 is capable of generating angular rates of 1 degree/second to 12,600 degrees/second in 0.1 degree steps.

5-3.4.1 Rate Programming. To program a rate, the following syntax is appended to the basic angular programming string:

S sXXX.X

Where XXX.X is the rate in degrees/second and s is the sign (+ or -, default = +).

Positive rates result in an increasing angle (counterclockwise rotation) and negative rates result in a decreasing angle (clockwise rotation). The starting angle is programmed with the normal angle programming command.

Example:

To Program a rate of 100 degrees/second starting at 45 degrees use the following:

04500011 S 100.0<cr><lf>

5-3.4.2 Triangular Wave Programming. Triangular wave rotation is not supported by the Model 5330. Program string of the following format will be accepted without error but **ignored.**

S sXXX.X E xxxxx

Where XXX.X is the rate in degrees/second, s is the sign, and xxxxx is the end angle in the same format as standard angle programming.

5-4 ILC-DDC MODEL SIM31200 EMULATION

In this mode of operation the Model 5330 will accept and execute remote interface commands formatted for the ILC Data Device Corp. Model SIM31200.

Table 5-3. SIM31200 Device Commands

Control Word/String	Function
P	Preset to Synchro, 11.8 V, Angle = 0, Delta = 0 (Static Mode)
S	Output Synchro Format
R	Output Resolver Format
1	Output 11.8 V L-L
2	Output 26 V L-L
9	Output 90 V L-L
A + (6 ASCII digits)	BCD Angle Arming Command
D + (6 ASCII digits)	BCD Delta (Step) Arming Command
!	Output Armed Angle
>	Increment Armed Angle by Delta
<	Decrement Armed Angle by Delta
B	Blank Display (Not Supported*)
N	Display ON (Not Supported*)
L	Lamp Test (Not Supported*)
C	Calibrate (Not Supported*)
*	Enter CAL Mode (Not Supported*)
/	Exit CAL Mode (Not Supported*)

* Command accepted without error but ignored.

5-4.1 Model SIM31200 Command Syntax. Model SIM31200 language is summarized in Table 5-3. Note that multiple commands may be concatenated together to form input command strings. Command must be terminated with Carriage Return, Line Feed and/or EOI.

5-4.2 Special Commands for SIM31203 Support. Commands for emulation of ILC-DDC Model SIM31203 are summarized in Table 5-4 below.

Table 5-4. SIM31203 Commands

Control Word/String	Function
G	Begin Dynamic Mode
H	Halt Dynamic Mode
I	Increment Angle
J	Decrement Angle

5-4.3 Service Request. The IEEE-488 RQS (Service Request) line will be asserted for the following conditions:

a. Overload (Not Supported)
b. Illegal Command
c. Reference Missing
d. At initial Power-up
e. Converter Output Angle Updated to new value (only when SRQ mask set to 111XXXXX)

When the RQS line is asserted, bit 6 of the Serial Poll Status Byte becomes True (1). Reading out the Serial Poll Status Byte clears the Service Request condition and bit 6 of the Serial Poll Status Byte. See also paragraph 5-4.5

5-4.4 Serial Poll Status Byte. The contents of the IEEE-488 Serial Poll Status Byte are summarized in Table 5-5 below.

Table 5-5. Serial Poll Status Byte

Bit	Function
0	True = Overload (Not Supported)
1	True = Illegal Command Received
2	Not Used
3,4	Reference Frequency Range
	Bit 4 Bit 3 Ref. Freq. Range
	F F Reference Missing
	F T 47-150 Hz
	T F 151-2000 Hz
	T T 2000-11000 Hz
5	True = Output Signal Updated
	False = Not Updated
6	RQS (Service Request)
7	Not Used

5-4.5 Service Request Mask Commands. Any or all of the Service Request conditions may be enabled or disabled with a user programmable mask corresponding to each bit of the serial poll status byte register. An ASCII string of 1's and 0's is used to represent a binary value to be ANDED with the serial poll status byte. See Table 5-5 for the function of each bit. A '1' will enable the bit while a '0' will disable it. The default value is 11011111, which enables all SRQ conditions except Converter Output Angle Updated. A query command is also provided to read current setting of the SRQ mask.

To program the SRQ mask value send the following command string:

SRQM<sp><mask bits><cr><lf>

where <mask bits> is a string of 8 ASCII 1's or 0's, MSB to the left, corresponding to the bits of the serial poll status byte.

To query the SRQ mask value send the following command string:

SRQM?<cr><lf>

Response will be a string of 8 ASCII characters representing the binary service request mask, MSB to the left. Default value is 11011111.

SECTION 6

PERFORMANCE CHECKOUT AND CALIBRATION

6-1 INTRODUCTION

This section describes the checkout test, and software calibration of the Model 5330.

6-2 CHECKOUT TEST

Checkout Test should be performed upon initial receipt of unit and at periodic intervals.

6-2.1 Frequency of Performance. The Checkout Test should be performed annually to verify conformance to specifications.

6-2.2 Checkout Test Procedure. Follow the steps shown below to verify conformance to specifications. Refer to Table 1-3 for required test equipment.

NOTE

Test Limits shown in Table 6-1 assume use of Synchro/Resolver Bridge North Atlantic Model 540/10 (for 400 Hz) or Model 540/20 (for all other Frequencies) with 9:1 step down null output. Any other equipment may require different Test Limit voltages.

a. Connect Signal Source to Model 5330 front panel RL and 26 terminals, and to Phase Angle Voltmeter REF input.
b. Set Signal source to 400 Hz, 26 Vrms.
c. Connect S1, S2, S3, and S4 outputs form Model 5330 to corresponding Synchro/Resolver Bridge inputs.
d. Connect Null Output of Synchro/Resolver Bridge to Phase Angle Voltmeter SIG input.
e. Set Model 5330 to 11.8 V L-L, Resolver Mode.
f. Set Bridge to Resolver Mode.
g. Verify that Phase Angle Voltmeter INPHASE voltage reading is within specifications shown in Table 6-1.
h. Repeat procedure in 10 degree steps from 0 to 350 degrees.
i. Repeat procedure for all frequencies, line-to-line voltages and modes shown in Table 6-1. If any readings are not within specifications, perform calibration procedure in section 6-3.

Table 6-1. Performance Check Limits

Frequency (Hz)	Mode	Volts L-L	Limit (μV)
47 (F2 only)	SYN	11.8	69
47 (F2 only)	RSL	11.8	69
47 (F2 only)	RSL	26	151
47 (F2 only)	SYN	90	524
47 (F2 only)	RSL	90	524
400	SYN	11.8	69
400	RSL	11.8	69
400	RSL	26	151
400	SYN	90	524
400	RSL	90	524
2,000	SYN	11.8	69
2,000	RSL	11.8	69
2,000	RSL	26	151
2,000	SYN	90	524
2,000	RSL	90	524
10,000	RSL	11.8	343

6-3 CALIBRATION

If periodic Checkout Test shows readings out of specification, calibrate unit as shown below.

6-3.1 Calibration Procedure. There are no adjustments within the Model 5330. All calibrations are accomplished using stored software corrections which are sent over the IEEE-488 bus. Proceed as follows:

a. Setup test equipment as shown for Checkout test except use Rear Panel 9-pin D-sub-miniature connector for hookup of Reference and S1-S4. Refer to Table 3-1 for pin assignments.
b. Calibrate all points shown in Table 6-2, in 10 degree steps from 0 degrees through 350 degrees.

c. Using computer with IEEE-488 interface and general purpose IEEE-488 debug program, send Selected Device Clear to Model 5330.
d. For each calibration, setup frequency, SYN/RSL mode, and line-to-line voltage per Table 6-2. Use appropriate syntax as shown in section 4.
e. Null Synchro/Resolver Bridge and record angle value shown on Bridge.
f. Change sign of recorded angle value and send to Model 5330 with the following syntax:

FNC RSL :CH00 SET CALA <angle value>

OR

FNC SYN :CH00 SET CALA <angle value>

as needed

g. Repeat step (e) to verify calibration correction.
h. Repeat for all 10 degree steps.
i. Repeat for all points indicated in Table 6-2.

Table 6-2. Calibration Points

Frequency (Hz)	Mode	Volts L-L
47 (F2 only)	SYN	11.8
47 (F2 only)	SYN	90
47 (F2 only)	RSL	11.8
47 (F2 only)	RSL	26
47 (F2 only)	RSL	90
400	SYN	11.8
400	SYN	90
400	RSL	11.8
400	RSL	26
400	RSL	90
2,000	SYN	11.8
2,000	SYN	90
2,000	RSL	11.8
2,000	RSL	26
2,000	RSL	90
5,000	RSL	11.8
5,000	RSL	26
10,000	RSL	11.8
10,000	RSL	26

SECTION 7

UPDATE INFORMATION

7-1 INTRODUCTION

As NAI continues to improve the performance of the Model 5330, corrections and modifications to the manual may be required. This section contains Product Revision Sheet (PRS) data which updates the unit to the most current configuration available.

WARRANTY

A. The seller warrants products against defects in material and workmanship for one year from the date of original shipment. The seller's liability is limited to the repair or replacement of products which prove to be defective during the warranty period. There is no charge under the warranty except for transportation charges. The purchaser shall be responsible for products shipped until received by the seller.

B. The seller specifically excludes from the warranty 1) calibration, 2) fuses, and 3) normal mechanical wear, e.g.: end-of-life on assemblies such as switches, relays, gear trains, etc. is dependent upon number of operations or hours of use, and end-of-life may occur within the warranty period.

C. The seller is not liable for consequential damages or for any injury or damage to persons or property resulting from the operation or application of products.

D. The warranty is voided if there is evidence that products have been operated beyond their design range, improperly installed, improperly maintained or physically mistreated.

E. The seller reserves the right to make changes and improvements to products without any liability for incorporating such changes or improvements in any products previously sold, or for any notification to the purchaser prior to shipment. In the event the purchaser should require subsequently manufactured lots to be identical to those covered by this quotation, the seller will, upon written request, provide a quotation upon a change control program.

F. No other warranty expressed or implied is offered by the seller other than the forgoing.

CLAIMS FOR DAMAGE IN SHIPMENT

The purchaser should inspect and functionally test the product(s) in accordance with the instruction manual as soon as it is received. If the product is damaged in any way, including concealed damage, a claim should be filed immediately with the carrier, or if insured separately, with the purchaser's insurance company.

SHIPPING

On products to be returned under warranty, await receipt of shipping instructions then forward the instrument prepaid to the destination indicated. The original shipping container with their appropriate blocking and isolating material is the preferred method of packaging. Any other suitable strong container may be used providing the product is wrapped in a sealed plastic bag and surrounded with at least four inches of shock absorbing material to cushion firmly, preventing movement inside the container.

DECLARATION OF CONFORMITY

We **NORTH ATLANTIC INSTRUMENTS, INC.**
170 WILBUR PL.
BOHEMIA, NY 11716-2416

declare under our sole responsibility that the product

5330 SERIES RESOLVER/SYNCHRO SIMULATOR

to which this declaration relates is in conformity with the following standard(s) or other normative document(s):

EN 50081-1: 1992 EN 55022; CONDUCTED EMISSIONS
EN 55022; RADIATED EMISSIONS

EN 50082-1: 1992 IEC 801-2; 1984 ESD
IEC 801-3; 1984 RADIATED IMMUNITY
IEC 801-4; 1988 EFT BURST

EN 61010-1: 1993/A2: 1995 SAFETY

following the provisions of COUNCIL DIRECTIVE 89/336/EEC
73/23/EEC

Place Bohemia, NY, U.S.A.

(Signature)

Date 9-10-97

Daniel A. Palladino
(Full Name)

Quality Analyst
(Position)

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