

SECTION 1

GENERAL DESCRIPTION

1.1 SCOPE

This instruction manual provides operating and maintenance instructions for the Series SIM-31200 Synchro and Resolver Angle Simulators. (See figure 1-1.) The equipment is manufactured by ILC Data Device Corporation, Bohemia, New York.

1.2 PURPOSE

The Series SIM-31200 instruments comprise a family of precision microprocessor-based solid state angle simulators designed to meet the demand for compact, high quality synchro and resolver source standards. They are suitable for production testing systems, quality control inspections, laboratory instrumentation, and portable use in the field. Easily interfaced with external digital control and test systems, these instruments may be incorporated for control and display into a variety of systems including navigation equipment, antenna positioning devices, and machine tool control systems. To provide complete synchro/resolver stimuli and measurement capability for automatic and semi-automatic test equipment (ATE), any series SIM-31200 instrument can be connected to its sister instrument, the SR-203 (or HSR-203) Angle Indicator.

The SIM-31200, SIM-31201, and SIM-31202 differ only in terms of digital input/output capabilities: the SIM-31203 adds a rate feature and the SIM-31204 is MATE compatible. ALL instruments may be operated remotely from a parallel digital input/output control. The SIM-31200 is intended primarily as a bench instrument as it includes a front panel keyboard and display without the IEEE-488 interface. The model SIM-31201 includes both front panel capability and the IEEE interface. The SIM-31202 is intended primarily as an ATE instrument; it has a blank front panel (no keyboard or display) and includes the IEEE interface.

1.3 EQUIPMENT SUPPLIED

Each instrument is supplied with a mating connector (Amphenol 17-10500-1) for INSTRUMENT INTERFACE connector J1, a detachable line cord, and an instruction manual.

1.4 PHYSICAL DESCRIPTION

The Series SIM-31200 instruments are compact lightweight units. As shown in figure 1-1, the keyboard, status indicators, and binding posts are conveniently grouped on the front panels of the Models SIM-31200 and SIM-31201. The red 7-segment LED displays, 0.43 inches high, are plainly visible behind a rectangular cutout in the front panel.

Internally, the basic instrument consists of two printed circuit boards (top and bottom), a front panel (blank on the Model SIM-31202), a rear panel and interconnecting cabling. Removal of the case exposes the top and bottom PC boards. The top board (fig. 5-1) contains a D/R converter packaged in a compact module, sine and cosine power amplifiers, output transformers and switching relays. The 6-digit LED display, also located on this board, is mounted so that the display is visible behind the rectangular cutout in the front panel of the instrument.

The bottom PC board (fig. 5-2) houses the microcomputer circuits, the GPIB interface circuits (Models SIM-31201 and SIM-31202) and the power supply.

The rear panel (fig. 1-2) contains interface connectors J1 and J2, the power connector and RFI filter, and switches associated with remote operation. Mounted to the inner surface of the rear panel is a fan which provides for cooling.

1.5 TECHNICAL CHARACTERISTICS

Table 1-1 summarizes the principal characteristics of the Series SIM-31200 instruments. Data covering the optional IEEE-488 is included in Table 1-2.

Table 1-1. Technical Characteristics

| Parameter | Value |
|--|---|
| Accuracy 47 Hz - 2 kHz | $\pm .003^\circ$ no load; $\pm .004^\circ$ @ 1.5VA $\pm .008^\circ$ @ 5VA |
| 10 kHz | $\pm .015^\circ$ no load; $\pm .03^\circ$ @ 1.5VA |
| NOTE | |
| Accuracy degrades as a linear function of frequency from 2 kHz to 11 kHz | |
| Angular Range | 000.000 $^\circ$ to 359.999 $^\circ$ BCD 000.000 $^\circ$ to 359.99966 $^\circ$ Binary; continuous rotation |

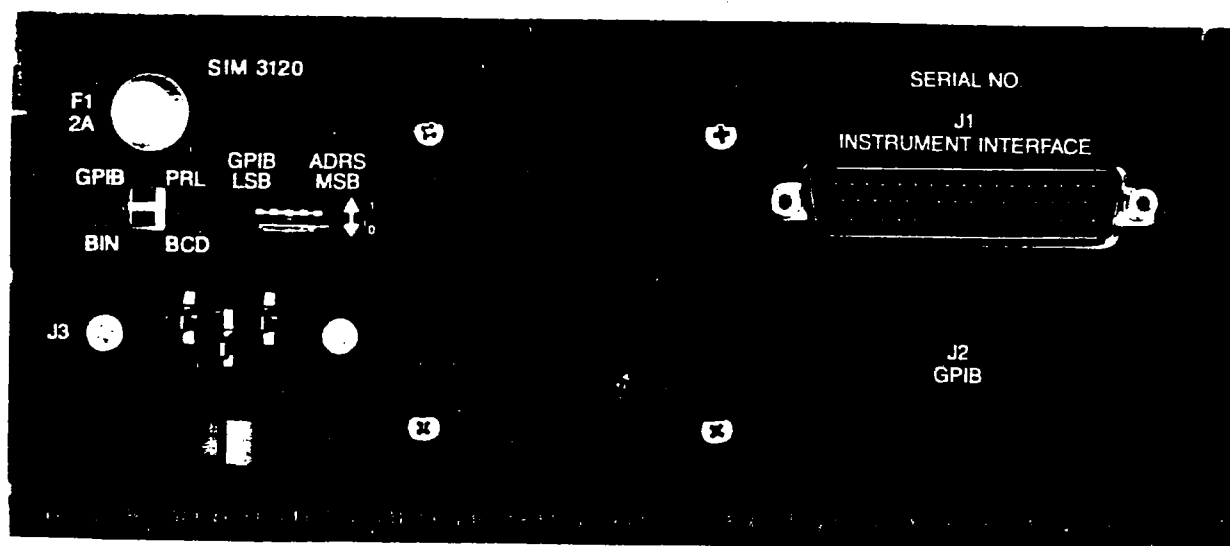


Figure 1-2. SIM-31201, Rear View

Table 1-1. Technical Characteristics (Cont'd)

| | |
|---|--|
| <p>Display</p> <p>Output Angle</p> <p>Status Indicators</p> | <p>6-digit, 7-segment .43" LED with polarizing filter</p> <p>Local, remote, synchro, re- solver, 11.8V, 26V, 90V, overload and reference loss LEDS</p> |
| <p>Digital Input/Output</p> <p>Parallel I/O Type</p> <p>Inputs</p> <p> Loading BCD/binary</p> <p> Angle input</p> <p>Other Inputs</p> <p>Outputs</p> <p> Drive capability</p> <p> Signals</p> <p>IEEE Interface</p> | <p>TTL compatible</p> <p>Open = "1"</p> <p>Gnd = "0"</p> <p>1 LS TTL load</p> <p>Switch selectable format, 22 data lines</p> <p>6 decades BCD or 20-bit binary:</p> <p>200°, 100°, 180/80°, 90/40°, 45/20°, 22.5/10°, 11/25/8°, 5.625/4°, 2.812/2°, 1.406/1°, .703/.8°, .351/.4°, .176/.2°, .088/.1°, .044/.08°, .022/.04°, .011/.02°, .0055/.01°, .0027/.008°, .0014/.004°, .00069/.002°, .00034/.001°</p> <p>Synchro/Resolver, 11.8V, 90V DATA T/H, MPU RESET</p> <p>5 standard TTL loads</p> <p>REF MISSING OVERLOAD PARALLEL INPUT RDY BIN/BCD GPIB/PARALLEL</p> <p>See Table 1-2.</p> |

Table 1-1. Technical Characteristics (Cont'd)

| | | |
|--|--|------------------------|
| Reference Input | | |
| Type | Transformer isolated | |
| Voltage Levels | 26 V RMS/115V RMS* | |
| Frequency | 47 Hz - 11 kHz | |
| Input Impedance | @ 26V : 50 K min @ 115V : 230 K min | |
| Harmonic content | 10% max. allowable | |
| Connection | Through either front panel binding posts or rear connector for both local and remote modes | |
| Max. Allowable Operating Voltage | @ 115V nominal : 127V @ 26V nominal : 29V | |
| Max. allowable Voltage - No damage | 150V for 115V Nom. 35V for 26V Nom. | |
| Breakdown Voltage | ±500V DC to logic gnd | |
| Factory Calibration Frequencies and Ranges | | |
| Synchro* | <u>Freq</u> | <u>Factory Cal. at</u> |
| 90V | 47-150 Hz | 60 Hz |
| | 200-1000 Hz | 400 Hz |
| 11.8V | 360-2000 Hz | 400 Hz |
| Resolver* | | |
| 11.8V | 360-2000 Hz | 400 Hz |
| | 2000-11000 Hz | 10 kHz |
| 90V | 200-2000 Hz | 400 Hz |
| User Calibration Frequencies | Anywhere within specified ranges | |

*These are the only outputs available on standard units, consult the factory for special voltages.

Table 1-1. Technical Characteristics (Cont'd)

| | | | | | | | | | | |
|--|--|-----------|---------|-----------|----------------------|---|---------|-----------------------|----------|---------|
| Synchro/Resolver Output | | | | | | | | | | |
| Type | Transformer isolated synchro (S1,S2,S3) or resolver (S1, S2,S3,S4) outputs | | | | | | | | | |
| Line-to-Line Output Levels | Programmable 11.8V, 26V or 90V RMS $\pm 0.5\%$ nom. | | | | | | | | | |
| Output Connections | Front panel binding posts and rear panel connector (active in both local and remote modes) | | | | | | | | | |
| Minimum L-L Load Impedance (Z_{L-L}) | <table><tr><td>90V L-L</td><td>26V L-L</td><td>11.8V L-L</td></tr><tr><td>Synchro 1215 ohms</td><td>-</td><td>21 ohms</td></tr><tr><td>Resolver 1620 ohms</td><td>135 ohms</td><td>28 ohms</td></tr></table> | 90V L-L | 26V L-L | 11.8V L-L | Synchro 1215 ohms | - | 21 ohms | Resolver 1620 ohms | 135 ohms | 28 ohms |
| 90V L-L | 26V L-L | 11.8V L-L | | | | | | | | |
| Synchro 1215 ohms | - | 21 ohms | | | | | | | | |
| Resolver 1620 ohms | 135 ohms | 28 ohms | | | | | | | | |
| Driver Capability | Will drive loads with any phase angle from -90° to $+90^{\circ}$ | | | | | | | | | |
| Time Phase | $\pm .4^{\circ}$ max. with respect to reference input | | | | | | | | | |
| Scale Factor Variation | $\pm .025\%$ simultaneous amplitude variation in all output lines as a function of digital angle | | | | | | | | | |
| Protection | Momentary and continuous overcurrent protection; output overload and reference input loss front panel indications; overtemperature shutdown protection | | | | | | | | | |
| Breakdown voltage | $\pm 500V$ DC to gnd | | | | | | | | | |
| Response Time | 7.5 mSec max upon receipt of input from parallel I/O or IEEE bus | | | | | | | | | |
| Warm-up Time | 30 seconds max. | | | | | | | | | |

Table 1-1. Technical Characteristics (Cont'd)

| | |
|--------------------------|--|
| Power Input | |
| Connector | Rear connector which includes EMI/RFI filter; separate line cord supplied. |
| Voltage | Switch selectable 115V/230V RMS $\pm 1\%$ |
| Power Frequency | 47 to 63 Hz; for 400 Hz line frequency, consult factory. |
| Power Consumption | 60VA (worst case) .5A @ 115VAC .25A @ 230VAC |
| Fuse (on Rear Panel) | Buss, GMW-2, 2 amps |
| Isolation | Transformer |
| Physical Characteristics | |
| Size | 8-1/8"W x 3-1/2"H x 14-1/2"D (20.6 cm x 8.9 cm x 36.8 cm) |
| Weight | 14 lbs (6.4 kg) |
| Mounting | Half-rack standard Full-rack optional* |
| Temperature Range | |
| Operating | 0° to 50°C |
| Storage | -65° to +100°C |

*Consult factory

Table 1-2. IEEE-488 Interface Data

Command Functions: The following subset of the IEEE-488 standard is implemented:

| | |
|-----|---|
| SH1 | Full <u>Source Handshake</u> capability |
| AH1 | Full <u>Acceptor Handshake</u> capability |
| T6 | Basic <u>Talk</u> capabilities with <u>Serial Poll</u> and untalk if my listen address. |
| L4 | Basic <u>Listen</u> capabilities with unlisten if my talk address. |
| SR1 | Full <u>Service Request</u> capability |
| RL1 | Full <u>Remote Local</u> capability including <u>Lockout</u> |
| DC1 | Full <u>Device Clear</u> capability |
| DT1 | Full <u>Device Trigger</u> capability |
| CO | No Controller capability |

Table 1-2. IEEE-488 Interface Data (Cont'd)

Device Commands

| Control Word/String (ASCII) | Function |
|--------------------------------|---|
| P | Preset to Synchro, 11.8V, "Angle" = "Delta" = 000.000° |
| S | Output Synchro Format |
| R | Output Resolver Format |
| 1 | Output 11.8 volt Line-to-Line |
| 2 | Output 26 volt Line-to-Line |
| 9 | Output 90 volt Line-to-Line |
| A + (6 ASCII digits) | BCD "Angle" Arming Command |
| D + (6 ASCII digits) | BCD "Delta" Arming Command |
| ! | Output Armed Angle |
| > | Increment Armed Output "Angle" by amount "Delta" |
| < | Decrement Armed Output "Angle" by amount "Delta" |
| B | Blank Display |
| N | Display ON |
| L | Lamp Test |
| C | Calibrate |
| * | Enter Calibrate Mode |
| / | Exit Calibrate Mode |

NOTE: Multiple commands may be concatenated to form input command strings. A terminating "linefeed" character must be appended to the end of the command string. Use of a "carriage return" before the "linefeed" is optional, but not necessary.

SRQ CONDITIONS

- (1) Overload
- (2) Illegal Command
- (3) Reference Missing
- (4) Following Power Turn-On
- (5) D/R Converter Output angle
updated to new value

Table 1-2. IEEE Interface Data (Cont'd)

| <u>Status Byte</u> | | | | | | | | | | | | | | | | | |
|--------------------|---|--|--------------|--------------|---------------------------------------|---|---|-------------------|---|---|----------|---|---|------------|---|---|--------------|
| <u>BIT</u> | <u>FUNCTION</u> | | | | | | | | | | | | | | | | |
| 0 | Overload | $\left\{ \begin{array}{l} \text{T - Overload} \\ \text{F - No overload} \end{array} \right.$ | | | | | | | | | | | | | | | |
| 1 | Illegal Command | $\left\{ \begin{array}{l} \text{T - Illegal Command Received} \\ \text{F - No Illegal Command Received} \end{array} \right.$ | | | | | | | | | | | | | | | |
| 2 | Not Used | | | | | | | | | | | | | | | | |
| 3,4 | Reference Frequency Range <table> <tr> <th><u>Bit 4</u></th><th><u>Bit 3</u></th><th><u>Reference Frequency Range (Hz)</u></th></tr> <tr> <td>F</td><td>F</td><td>Reference Missing</td></tr> <tr> <td>F</td><td>T</td><td>47 - 150</td></tr> <tr> <td>T</td><td>F</td><td>151 - 2000</td></tr> <tr> <td>T</td><td>T</td><td>2000 - 11000</td></tr> </table> | | <u>Bit 4</u> | <u>Bit 3</u> | <u>Reference Frequency Range (Hz)</u> | F | F | Reference Missing | F | T | 47 - 150 | T | F | 151 - 2000 | T | T | 2000 - 11000 |
| <u>Bit 4</u> | <u>Bit 3</u> | <u>Reference Frequency Range (Hz)</u> | | | | | | | | | | | | | | | |
| F | F | Reference Missing | | | | | | | | | | | | | | | |
| F | T | 47 - 150 | | | | | | | | | | | | | | | |
| T | F | 151 - 2000 | | | | | | | | | | | | | | | |
| T | T | 2000 - 11000 | | | | | | | | | | | | | | | |
| 5 | Synchro/Resolver Output Valid Flag | $\left\{ \begin{array}{l} \text{T - Output signal updated} \\ \text{F - Output signal not updated} \end{array} \right.$ | | | | | | | | | | | | | | | |
| 6 | RQS (Request for Service) | | | | | | | | | | | | | | | | |
| 7 | Not used | | | | | | | | | | | | | | | | |