

	<b>Model 8500</b>
	Angle Position Indicator



- **0.01° Resolution**
- **0.03° Accuracy on each of the two independent channels**
- **Auto-compensation of phase shift errors maximizes accuracy**
- **Auto-ranging adjusts to any line-to-line voltage of 10-100V**
- **Optional IEEE-488 interface for remote sensing and control**

The Model 8500, API is a Synchro/Resolver-to-digital converter that performs high quality analog-to-digital conversions of Synchro or Resolver data.

The API transmits the converted digital representation of the analog data simultaneously to the following locations:

- The front panel display which uses six seven-segment LED planar information displays.
- The BCD outputs of the rear panel parallel I/O connector.
- The optional IEEE-488 interface bus, which has full MATE compatibility.

The Model 8500 is housed in a 9 1/2-inch wide rack panel and is packaged primarily for computer controlled or fixed installation applications.

**Front Panel Description:** The front panel contains a group of controls and indicators including a power ON/OFF switch, a set of function switches and coordinated LED indicators, a set of input terminals, and a display for angular data, degree/minutes, and IEEE-488 interface status information. (See table on next page)

**Rear Panel Description:** The rear panel provides an ac input receptacle (J2), a parallel I/O connector (J1), and an 8-position mode DIP-Switch with appropriate instruction label. An IEEE-488 ADDRESS switch and connector (J3) are optionally available. (See table on next page)

**Power Requirements:** The API operates with either 115 V ac or 230 V ac, 47 to 440 Hz power source. Power may be applied from the line cord or parallel I/O rear connector J1. Refer to tables, J1 power connections and switch selection of voltage and power source

**Internal Power Connections:** All API models are factory set for 115 V AC line cord operation (line cord is supplied), but can operate using 115 V AC or 230 V AC as selected by an internal switch. In addition, a rear power connector, which also accepts 115 V/230 V AC, can be used in place of the line cord by selecting the position of an internal switch (see pin designations).

## Specifications

Item	Specification										
Input Specifications											
Input channels	2 (selectable)										
Signal inputs	Automatic line-to-line tracking, Synchro or Resolver. 10 to 100 V L-L, 47-440 Hz (F2, option 2) or 360 to 1200 Hz (F2, option 4).										
Signal input impedance	250 k ohms (minimum)										
Reference levels	1 to 115 V rms, all frequency ranges. (All Synchro or Resolver data must be derived from this reference.)										
Reference input impedance	100 k ohms (minimum)										
Power requirements	115/230 V rms± 10% 47 to 440 Hz, 20 VA										
Data Freeze	<table> <tr> <td><u>Freeze</u></td><td><u>Track</u></td></tr> <tr> <td>DF</td><td>+5 V</td></tr> <tr> <td></td><td>0 V or open</td></tr> <tr> <td><math>\bar{D}F</math></td><td>0 V</td></tr> <tr> <td></td><td>+5 V or open</td></tr> </table>	<u>Freeze</u>	<u>Track</u>	DF	+5 V		0 V or open	$\bar{D}F$	0 V		+5 V or open
<u>Freeze</u>	<u>Track</u>										
DF	+5 V										
	0 V or open										
$\bar{D}F$	0 V										
	+5 V or open										
	(Display and output frozen; internal circuitry continues to track signal.)										
Channel Remote Program	0 V or GND=CH1, +5 V or OPEN=CH2										
Output Specifications											
Display	5 decimal digits, 0.56-inch high LED indicators for channel and remote										
Readout resolution	0.01 degree or 1 minute (F2, option 2 or 4)										
Digital output data	5 decades of BCD digits (1,2,4,8 code)										
Digital output level											
Logic 1	+3.9 V minimum, 4 standard LS TTL loads										
Logic 0	0.1 V maximum										
Converter Busy	TTL compatible (pulses are present when converter is busy)										
Performance Specifications											
Angular Accuracy	0.03 degrees										

## Specifications

Item	Specification
Angular Resolution	0.01 degrees
Angular Range	0 to 359.99 degrees or 0 to 359 degrees 59 minutes; or, -179.99 to +180 degrees or -179 degrees 59 minutes to +180 degrees 00 minutes (F2=2 or 4)
Auto phase correction	Automatically corrects for signal phase shift up to $\pm 80$ degrees.
Tracking speed	Selectable: Lo speed = 180 degrees/sec with no tracking error, 47-440 Hz (F2, option 2)  Hi speed = 1800 degrees/sec with no tracking error, 360-1200 Hz (F2, option 4)
Settling time	Dependent on tracking speed selected and frequency range: Less than 1.5 seconds for 180 degrees step change, Lo tracking speed and 47-440 Hz (F2, option 2).  Less than 1.0 seconds for 180 degrees step change, Hi tracking speed and 360-1200 Hz (F2, option 4).
Velocity output:	
HI Tracking rate	2.85 mV dc/degree/second (nominal)
LO Tracking rate	28.5 mV dc/degree/second (nominal)
Operating mode	Track only
Fault indications	No reference present: all 8s displayed No Synchro or Resolver connected or input line-to-line voltage is too low: display is blanked. Over velocity: "o" displayed to left of angle display Optional IEEE-488 MATE relay closure
Lamp test	Disconnect reference to display all 8s or apply logic "0" to J1-38.
Mechanical Specifications	(See figure 2-1 Outline and Dimension Drawing, API Model 8500)
Front Panel Color	Semi-gloss gray, 26440 per Fed-Std-595 window area black #27038 per Fed-Std-595
Markings	Semi-gloss black enamel 27038 per Fed-Std-595; Pantone Warm Red U (warnings and logo only); White #27875 per Fed-Std-595
Size	9.5" W x 1.75" H x 12" D
Weight	4 lbs. (maximum)
Operating Temperature	0-50° C

## ORDERING INFORMATION

### Features and Options:

To identify the Model 8500 options, a three-digit number is assigned in accordance with table below.

For example, the Standard Model 8500 with half rack mounting (1), 47 Hz to 440 Hz frequency selectable display (2), and parallel interface (1) would have an option number of F121.

8500-F

1	2	1
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F1    F2    F3

No.	Feature	Options
F1	Configuration Options	1. Panel mount, half rack 2. Bench use (includes front terminals and stand) 3. Panel mount, full rack
F2	Frequency and Display	2. 47-440 Hz, selectable display 4. 360 Hz to 1200 Hz, selectable display
F3	Interface	1. Parallel only 2. Parallel and IEEE

### Accessories:

The API can be ordered with mounting adapters for mounting either one or two units in a standard 19-inch equipment rack. The table below describes full rack and tandem full rack mounting accessories:

Type of Mount	Description	NAI P/N
Full Rack Mounting	Mounts one unit in 19-inch rack	300697
Tandem Full Rack Mounting	Mounts two units side by side in 19-inch rack	300698

The parallel I/O 50-pin mating connector, J1 is supplied by North Atlantic Industries (NAI P/N 783718) but operator must make cable assembly. It consists of the following parts:

Description	AMP P/N	Qty
Shell	205211-1	1
Clamp	205732-1	1
Retainer	205980-1	2
Pins	66569-3	50

### Front Panel Controls and Indicators

Control/Indicator	Function
PWR push button	Alternate Acting Switch. Turns power on and off (push button in: power on; push button out: power off).
REM push button	Alternate Acting Switch. Selects remote operation of the API (push button in: Remote; push button out: local).
CHAN push button	Alternate Acting Switch. Selects input channel (push button in: CH 1; push button out: CH 2).
HOLD push button	Momentary Switch. Push in to freeze display and output data.
REM LED	When ON, indicates the API is in remote operation.
CHAN LED	When on, indicates Channel 1 is selected. When off, indicates Channel 2 is selected.

### **CAUTION**

Terminals S1, S2, S3, S4, and REF HI and LO are directly connected to the transformer inputs and must not be used if J1 inputs are used. Refer to table 2-1, J1 pin connections.

S1,S2,S3,S4 Terminals	Accepts Synchro or Resolver input signals (bench units only).
REF HI and LO Terminals	Accepts reference input signal (bench units only).

### Rear Panel Description

Control/Indicator	Function
Input Power Receptacle	Power cable connector (J2) for 115 V ac or 230 V ac input.
ADDRESS Switches	ADDRESS DIP switches set unit address for IEEE bus.
Parallel I/O Connector	Provides API interconnection with external systems, power sources, etc. Refer to table 2-1.
MODES Switch	8-position DIP switch which controls selectable modes. Refer to paragraph 3-3.3.
IEEE-488 Connector (optional)	Connects IEEE-488 standard I/O bus to unit.

### Mode Switch SW2

Switch Number	Switch Signal Name	Switch Position	
		1	0
1	CH1 SYN	Channel 1 in Resolver mode or for remote control of Channel 1.	Channel 1 in Synchro mode.
2	CH2 SYN	Channel 2 in Resolver mode or for remote control of Channel 2.	Channel 2 in Synchro mode.
3	INT/EXT REF	Selects auto phase corrected internal reference.	Selects external reference.
4	Bandwidth (H/L)	Selects low bandwidth (tracking speed) or remote control of tracking speed.	Selects high bandwidth (tracking speed).
5	Deg/Min	Selects 2 LSDs of display in minutes of arc.	Selects 2 LSDs of display in hundredths of degrees.
6	Display (U/B)	Unipolar display. (0° to 359.99°) or remote control of display.	Bipolar display $\pm 180^\circ$ .
7	Sign	Sign bit equals plus sign (+) in F2=2 or 4 units.	Sign bit equals minus sign (-) in F2=2 or 4 units.
8	P/I	Selects IEEE-488 interface for remote control	Selects parallel interface for remote control.

# J1 Pin Designations

Pin	Function
1	Power input Hi (internal switch enables pins 1 & 2; disables IEC power connector)
2	Power input lo
3	Chassis ground
4	Digital ground
5	S1 ( <i>Channel 1</i> )
6	S2 “ “
7	S3 “ “
8	S4 “ “
9	R1 “ “
10	R2 “ “
11	Converter Busy
12	.04° or 4'
13	.01° or 1'
14	.8° or not used
15	.2° or 20'
16	4°
17	1°
18	Channel 2 Synchro jumper (connect to pin 35 for channel 2 Synchro operation)
19	NC
20	Tracking HI/LO input
21	S1 ( <i>Channel 2</i> )
22	S2 “ “
23	S3 “ “
24	S4 “ “
25	R1 “ “
26	R2 “ “
27	Data freeze ( $\overline{DF}$ )
28	.02° or 2'
29	.08° or 8'
30	.1° or 10'
31	.4° or 40'
32	2°
33	8°
34	Channel 1 Synchro jumper (connect to pin 35 for channel 1 Synchro operation)
35	Synchro jumper common
36	Fault 1 ( <i>not used</i> )
37	Fault 2 ( <i>not used</i> )
38	$\overline{\text{Lamp Test}}$
39	Unipolar/Bipolar for F2=2 or 4
40	BITE output ( <i>Built in Test Equipment</i> )
41	Velocity output ( <i>analog</i> )
42	Data Freeze ( <i>DF</i> )
43	Remote Program (0=CH1, 1=CH2)
44	NC spare
45	20° <i>BCD Outputs</i>
46	40° “ “
47	80° “ “
48	10° “ “
49	100° “ “
50	200° or sign bit in bipolar “ “