MODEL 32500
ELECTRONIC COMPASS

CE

REV K080703

MANUAL PN 32500-90

R. M. YOUNG COMPANY

MODEL 32500
ELECTRONIC COMPASS

SPECIFICATIONS*

Compass:
Resolution:	0.5 degrees
Accuracy:	±2 degrees (rms)

Wind Speed Input:
Sensor Type:	AC Frequency Generator
Sensitivity:	50mV p-p minimum
Range:	0-2000 Hz

Wind Direction Input:
Sensor Type:	Potentiometer
Range:	0-5000mV = 0 to 355 degrees
Excitation:	5000mV (limited to 5 mA)

Voltage Inputs (Auxiliary Sensor Inputs):
VIN1 and VIN2	0-1000mV
VIN3 and VIN4	0-5000mV

Voltage Outputs:
OUT1	0-5000mV	0-100 m/s wind speed
OUT2	0-5000mV	0-360° true wind dir (Uses compass measurement to produce true wind direction.)

Serial Output:
Full duplex RS-232,
Half duplex RS-485 (25 mS switchover)
1200, 2400, 4800, and 9600 baud
8 data, 1 stop, no parity

Operating Temp: -50°C to 50°C
Power: 11 to 30 VDC, 40 mA

Mounting: 1 inch IPS (1.34 inch actual diameter)

Size:
4.75" (12cm) H
0.87" (7.3cm) W
2.12" (5.3cm) D

*Specifications subject to change

1.0 INTRODUCTION

The Model 32500 ELECTRONIC COMPASS measures magnetic heading and incorporates auxiliary inputs to measure signals from YOUNG sensors. Wind speed and direction sensors, temperature and humidity sensors, barometers and other meteorological instruments can connect directly to 32500 inputs. Two specialized wind sensor inputs and four general purpose voltage inputs convert measurements to high-resolution numerical values. Wind direction input may be combined with compass readings to obtain true direction.

Measurements are converted to RS-232 or RS-485 serial formats or calibrated voltage outputs. Both continuous and polled outputs are available. When polled, up to 16 units can be networked together. For marine applications the 32500 produces standard NMEA output sentences. Voltage output for wind speed and direction is available when the 32500 is connected to a YOUNG wind sensor.

1.1 INSTALLATION

The 32500 is supplied in a weather-resistant enclosure with a mounting adapter that fits 1 inch IPS pipe (1.34 inch nominal diameter). When used with the YOUNG Wind Monitor, the mounting adapter engages the Wind Monitor orientation notch. Refer to the WIRING DIAGRAM for electrical connection details and jumper settings. Place jumpers to select desired output format. Once installed, the compass must be calibrated to correct for local magnetic distortions caused by nearby structures. To calibrate the compass, follow the procedure outlined below.

1.2 SETUP

Operating mode may be set with simple jumpers or customized with software commands via serial connection. Settings are retained when power is removed.

1.2.1 COMPASS CALIBRATION

1. Remove cover from compass. Press and hold CALIBRATE button for 5 seconds. The CALIBRATE indicator will begin to blink. Refer to WIRING DIAGRAM to locate CALIBRATE button.

2. Slowly rotate vehicle on which compass is mounted. Steer vehicle in a tight circle and make TWO complete revolutions. Each revolution should take at least one minute. THE COMPASS MUST REMAIN LEVEL DURING CALIBRATION.

3. After two complete revolutions, press and hold CALIBRATE button until indicator stops blinking. Calibration is now complete. Calibration parameters are retained when power is removed.

4. Replace cover. Use this procedure to recalibrate compass at any time.

1.2.2 AUXILIARY INPUTS

The 32500 has two special inputs for wind speed and direction and four auxiliary voltage input channels for connection to other meteorological instruments like temperature and humidity sensors, and barometers. For best performance, the sensors should be installed within 3m (10ft.) of the 32500. Measurements from the auxiliary input channels are converted to numerical values (0-4000 Full Scale) and sent in the selected serial output string.

For VIN1 and VIN2 full scale input is 1.00 VDC, therefore:
    Serial output value = input millivolts x 4

For VIN3 and VIN4 full scale input is 5.00 VDC, therefore:
    Serial output value = input millivolts x 0.8

Refer to serial output format drawing and wiring diagram.

1.2.3 JUMPERS

W1 JUMPERS The two W1 jumpers determine serial output format. The two jumper positions are designated A and B. Four possible jumper configurations and associated output format are listed below. The first three configurations set the 32500 output to a popular format without further intervention. The last configuration, SOFTWARE MODE, allows output format and other operating parameters to be set via a software Command menu. Refer to the WIRING DIAGRAM for jumper locations. Refer to the SERIAL FORMAT DIAGRAM for details regarding serial output format. The SERIAL COMMUNICATION section provides details about SOFTWARE MODE.

JUMPERS	SERIAL OUTPUT FORMAT
NONE	WS WD1 V1 V2 V3 V4 COMPASS WD2
A	RMYT for connection to YOUNG Wind Tracker
B	NMEA sentences
A & B	SOFTWARE MODE

The first 3 format selections override any software commands given in the above SOFTWARE MODE. See page 4 for detailed SERIAL OUTPUT FORMAT information.

W2 JUMPERS The W2 jumper pattern sets the output connection type. Only one connection type may be used at one time. Refer to the WIRING DIAGRAM drawing for jumper location and connection details.

JUMPERS	OUTPUT TYPE
VOUT	Calibrated output for wind speed and direction. 0-5000mV = 0-100 m/s 0-5000mV = 0-360 degrees
232	RS-232 full duplex serial input/output
485	RS-485 half duplex serial input/output

1.2.4 SERIAL COMMUNICATION

Both RS-232 and RS-485 connections are available. The RS-232 type is the simplest to use and features full-duplex operation. Transmission distances of up to 30M (100ft.) using RS-232 are acceptable. The RS-485 option is a good choice in electrically noisy environments, in cases where the units must be networked, or in NMEA marine applications where the differential RS-485 signal levels are required.

The RS-485 connection is half-duplex meaning the unit cannot transmit and receive at the same time. Internal hardware and software automatically manage the transition from transmit to receive as needed. However, when using RS-485, be sure that any externally connected devices are also capable of managing the transition for itself. YOUNG RS-485/232 converter modules incorporate this capability. Transmission distances up to 70km (4mi.) using RS-485 are possible.

Three of the W1 jumper configurations set predetermined serial output formats without further setup or intervention. When W1 jumpers are set for SOFTWARE MODE, operating parameters may be set via the Command menu using a simple serial communications program such as the popular HyperTerm or ProComm.

1.2.5 COMMANDS

To access the Command menu, with W1 jumpers set to SOFTWARE MODE, send three ESC (ASCII 27) characters to the 32500 in quick succession via the serial connection. The 32500 replies by sending the Command menu with these options:

```
COMMANDS
----------------------
B) BAUD
C) CALIBRATE VOLTAGE
D) DAMPING
F) FORMAT
R) RATE
S) STATUS
X) EXIT TO OPERATE MODE
```

NOTE: The RATE menu item does not appear when the output format is RMYT. In that case the rate is preset.

BAUD sets the serial communications baud rate.

NOTE: Selecting output formats NMEA or RMYT via W1 jumpers or the FORMAT menu item may change the baud rate without user intervention. Also, your serial communications program must always be set to the same baud rate as the 32500 or it will be unable to communicate.

```
BAUD RATE
----------
A) 1200
B) 2400
C) 4800
D) 9600
X) EXIT
```

CALIBRATE VOLTAGE is used to calibrate voltage inputs and external devices connected to the voltage outputs. This command should be used only by qualified technicians.

To calibrate the voltage inputs, apply full scale reference voltage to an input and select the menu item associated with that input. The standard full scale input for VIN1 and VIN2 is 1.000 VDC. For VIN3 and VIN4 the full scale input is 5.000 VDC.

Whatever voltage appears on the input when the menu item is selected will be recorded internally as the full scale value and used to scale all measurements on that input channel when the 32500 is in OPERATE mode. IMPROPER CALIBRATION WILL RESULT IN ERRONEOUS MEASUREMENTS.

Use menu items E and F to calibrate externally connected devices such as data loggers and chart recorders. To use items E and F, jumper W2 must be set for voltage outputs. See W2 JUMPERS for additional details.

```
OPTIONS A THRU D FOR
QUALIFIED TECHNICIAN ONLY!
IMPROPER USE CAUSES ERRONEOUS
CALIBRATION DATA TO BE STORED.

CALIBRATE VOLTAGE
-----------------
A) VIN1 FS
B) VIN2 FS
C) VIN3 FS
D) VIN4 FS
E) VOUT ZERO
F) VOUT FS
X) EXIT
```

DAMPING sets the amount of averaging to use on compass measurements. When DAMPING is set to NONE or FAST, compass readings change quickly. When set to SLOW, the readings change more gradually and are often easier to interpret.

```
COMPASS DAMPING
-----------------
N) NONE
F) FAST
S) SLOW
X) EXIT
```

FORMAT selects the serial output format. Formats RMYT and NMEA will automatically change the baud rate. See the SERIAL FORMAT DIAGRAM for details.

```
OUTPUT FORMAT
-----------------------------------------------------------
A) RMYT
B) RMY POLLED
C) NMEA (KNOTS DEGREES(TRUE))
D) NMEA (KNOTS DEGREES(TRUE) TEMP RH BARO)
E) SPEED DIR(CORRECTED) V1 V2 V3 V4 COMPASS DIR(UNCORRECTED)
F) COMPASS DIAGNOSTICS
X) EXIT
```

When RMY POLLED is selected, a prompt appears for entering a single character 'address':

```
 ENTER SINGLE CHAR POLL ADDR [0-9, A-Z, a-z] : a
```

This is the address character that must be used when polling the 32500 for data. By using unique addresses, up to 16 units may be networked on the same RS-485 connections.

RATE sets the output rate. The RATE menu item does not appear when the output format is RMYT since, for that format, the output is fixed at 15 Hz. The 0.1 Hz output means that an output appears once every 10 seconds.

```
OUTPUT RATE
-----------
A)  15 HZ
B)   2 HZ
C) 0.1 HZ
X) EXIT
```

STATUS reports firmware version and other parameters. These values are used only by qualified technicians to asses the state of the 32500. A typical STATUS report appears below.

```
STATUS
YOUNG 32500 ELECTRONIC COMPASS v1.22
------------------------------------
```

```
        VIN1 FS: 3716
        VIN2 FS: 3715
        VIN3 FS: 4094
        VIN4 FS: 4095

        FORMAT: RMY POLLED
     POLL ADDR: a
   OUTPUT RATE: 15 HZ
          BAUD: 9600
 OFFSET X,Y,RATIO: -251, 75, 847
 COMPASS DAMPING: SLOW
   WATCHDOG TIMER: ENABLED
```

1.2.6 POLLED MEASUREMENTS

When the serial output format is RMY POLLED, the 32500 sends data only when it receives a polling command that contains the unique address of the unit being polled. The command for polling is:

Ma!

where a = address character.

See the SERIAL FORMAT DIAGRAM for details on the data sent from the 32500 when polled.

1.3 MAINTENANCE

Like all quality measuring instruments, the 32500 Electronic Compass should be periodically recalibrated. The recalibration period depends on the application but once per year is typical. The unit may be sent to the factory or your distributor for recalibration. A copy of the calibration procedure is available to qualified technicians.

In order to compensate for local magnetic conditions, the compass calibration can take place only at the site where it is installed. **If the installation is changed, the compass must be recalibrated for the new conditions.** In addition to changing the actual installation, local conditions may also change by the introduction of iron masses or electrical machinery and thus warrant recalibration.

1.4 WARRANTY

This product is warranted to be free of defects in materials and construction for a period of 12 months from date of initial purchase. Liability is limited to repair or replacement of defective item. A copy of the warranty policy may be obtained from R. M. Young Company.

CE COMPLIANCE

This product has been tested and shown to comply with European CE requirements for the EMC Directive. Please note that shielded cable must be used.

Declaration of Conformity

Application of Council Directives: 89/336/EEC
Standards to which Conformity is Declared:
    EN 50081-1
    EN 55022 (CISPR 22 class A)
    EN 50082-1 (IEC 801-2, 3, 4)
Manufacturer's Name and Address: R. M. Young Company
                    Traverse City, MI, 49686, USA
Importer's Name and Address: See Shipper or Invoice
Type of Equipment: Meteorological Instruments
Model Number / Year of Manufacture: 32400/32500/2000

I, the undersigned, hereby declare that the equipment
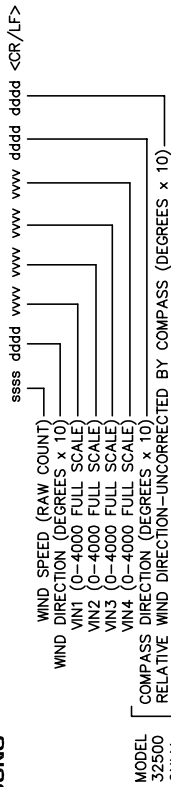specified conforms to the above Directives and Standards.

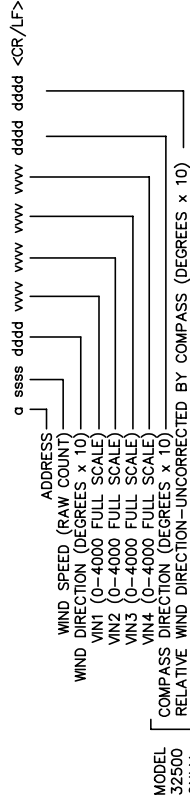**Date / Place:** Traverse City, Michigan, USA September 1, 2000

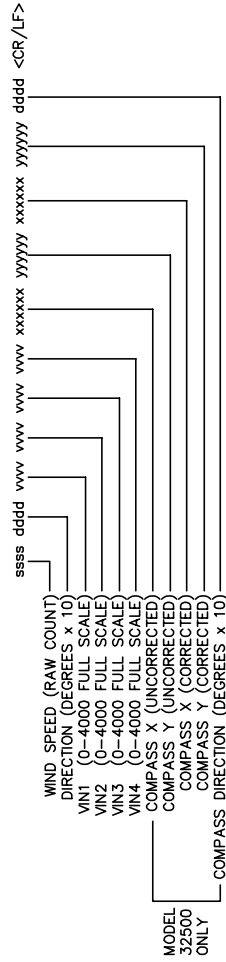*David Poinsett*

David Poinsett
R & D Manager, R. M. Young Company

RMYT SERIAL OUTPUT
SIX BYTES IN BINARY FORMAT.

AB CD SS SS DD DD
- TWO-BYTE HEADER (HEX)
- WIND SPEED (RAW COUNT TWO-BYTE INTEGER)
- DIRECTION x 10 (TWO-BYTE INTEGER)

NMEA (KNOTS DEGREES) SERIAL OUTPUT
EACH FIELD CONSISTS OF ALPHANUMERIC ASCII TEXT.

$WIMWV, ddd, a, sss.s, N, A *hh<CR/LF>
- NMEA HEADER
- DIRECTION (0-360 DEGREES)
- DIRECTION REFERENCE (T)RUE OR (R)ELATIVE
- WIND SPEED (KNOTS)
- WIND SPEED UNITS N=KNOTS (NAUTICAL MPH)
- DESIGNATES GOOD DATA
- CHECKSUM FIELD

NMEA (TEMP RH BARO) SERIAL OUTPUT
EACH FIELD CONSISTS OF ALPHANUMERIC ASCII TEXT.

$WIXDR,C,000.0,C,TEMP,H,000,P,%RH,P,0.000,B,BARO *hh<CR/LF>
- TRANSDUCER TYPE = NMEA HEADER
- TRANSDUCER TYPE = TEMPERATURE
- TEMPERATURE
- UNITS = CELSIUS
- TRANSDUCER ID
- TRANSDUCER TYPE = HUMIDITY
- RELATIVE HUMIDITY
- UNITS = PERCENT
- TRANSDUCER ID
- TRANSDUCER TYPE = PRESSURE
- BAROMETRIC PRESSURE
- UNITS = BARS
- TRANSDUCER ID
- CHECKSUM FIELD

RMY SERIAL OUTPUT
EACH FIELD CONSISTS OF ALPHANUMERIC ASCII TEXT.

ssss dddd vvvv vvvv vvvv dddd dddd <CR/LF>
- WIND SPEED (RAW COUNT)
- WIND DIRECTION (DEGREES x 10)
- VIN1 (0-4000 FULL SCALE)
- VIN2 (0-4000 FULL SCALE)
- VIN3 (0-4000 FULL SCALE)
- VIN4 (0-4000 FULL SCALE)
- COMPASS DIRECTION (DEGREES x 10)
- RELATIVE WIND DIRECTION-UNCORRECTED BY COMPASS (DEGREES x 10)

MODEL 32500 ONLY

RMY POLLED SERIAL OUTPUT
EACH FIELD CONSISTS OF ALPHANUMERIC ASCII TEXT.

a ssss dddd vvvv vvvv vvvv dddd dddd <CR/LF>
- ADDRESS
- WIND SPEED (RAW COUNT)
- WIND DIRECTION (DEGREES x 10)
- VIN1 (0-4000 FULL SCALE)
- VIN2 (0-4000 FULL SCALE)
- VIN3 (0-4000 FULL SCALE)
- VIN4 (0-4000 FULL SCALE)
- COMPASS DIRECTION (DEGREES x 10)
- RELATIVE WIND DIRECTION-UNCORRECTED BY COMPASS (DEGREES x 10)

MODEL 32500 ONLY

DIAGNOSTIC SERIAL OUTPUT
EACH FIELD CONSISTS OF NUMBERS AS ASCII TEXT.

ssss dddd vvv vvv vvv vvv xxxxxx xxxxxx yyyyyy yyyyyy dddd <CR/LF>
- WIND SPEED (RAW COUNT)
- DIRECTION (DEGREES x 10)
- VIN1 (0-4000 FULL SCALE)
- VIN2 (0-4000 FULL SCALE)
- VIN3 (0-4000 FULL SCALE)
- VIN4 (0-4000 FULL SCALE)
- COMPASS X (UNCORRECTED)
- COMPASS Y (UNCORRECTED)
- COMPASS X (CORRECTED)
- COMPASS Y (CORRECTED)
- COMPASS DIRECTION (DEGREES x 10)

MODEL 32500 ONLY

WIND SENSOR	M/S	MPH	KNOTS	KM/HR
03002 *	M=0.3752 0=0.2	M=0.8390 0=0.4	M=0.7285 0=0.4	M=1.3505 0=0.7
04101	0.04903	0.1097	0.09526	0.1765
04106	0.04903	0.1097	0.09526	0.1765
05103	0.04903	0.1097	0.09526	0.1765
05106	0.04903	0.1097	0.09526	0.1765
05305	0.05123	0.1146	0.09956	0.1844

PULSES FROM THE WIND SPEED SENSOR ARE ACCUMULATED OVER 0.9994 SECONDS. CIRCUITS IN THE 32400 CAUSE TWO PULSES TO BE COUNTED FOR EACH ONE RECEIVED.

THE ADJACENT CHART SUMMARIZES MULTIPLIERS USED TO CONVERT RAW PULSE COUNT VALUES IN THE SERIAL STRING TO STANDARD WIND SPEED UNITS.
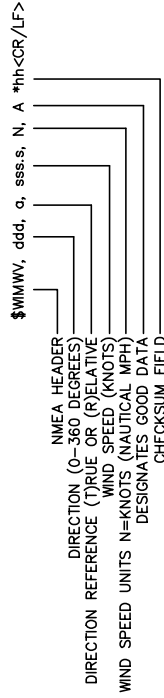
FOR EXAMPLE:
SENSOR = 05103 WIND MONITOR
RAW PULSE COUNT IN SERIAL STRING = 323
FOR MPH USE MULTIPLIER = 0.1097
WIND SPEED = 323 x 0.1097 = 35.4 MPH

* Model 03002 is a cup wheel type sensor therefore the wind speed must be calculated using a multiplier (M) and offset (0).
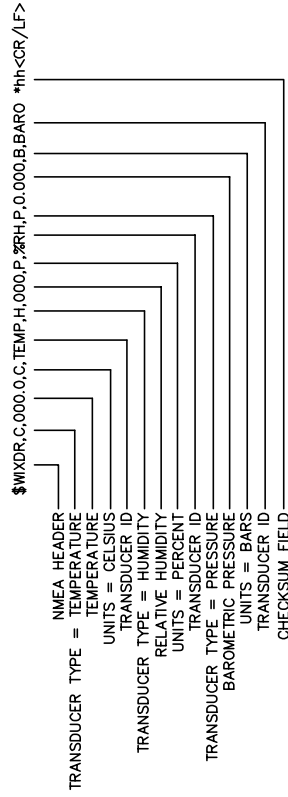
WIND MONITOR

MODEL 32400 SERIAL INTERFACE
MODEL 32500 ELECTRONIC COMPASS

RED — 6
WHT — 5
GRN — 4
BLK — 3
2
BRN — 1

AUXILIARY SENSOR CONNECTIONS

(11–30 VDC) 100 mA MAX (A)
(0–1000 mV)
(0–5000 mV)
(0–5000 mV)
POWER & SIGNAL REFERENCE
SHIELD OF SENSOR CABLE

MAXIMUM RECOMMENDED CABLE LENGTH 3M (10 Ft)

(A) THESE VOLTAGES ARE THE SAME

RED —— POWER 11–30 VDC (A)
BLK —— POWER REFERENCE
GND —— TO EARTH GROUND (⏚)

+PWR OUT
VIN1
VIN2
VIN3
VIN4
REF
GND

EXC
WD
WS
REF
GND

WIND SENSOR INPUT

WHT
GRN
RED
BLK *
BRN *

POWER INPUT

CALIBRATE SWITCH (MODEL 32500 ONLY)

CALIBRATE INDICATOR (MODEL 32500 ONLY)

W1
A
B

485
232
VOUT
W2

OUT1
OUT2
REF

RED
BLK
GND

PWR+ INP
REF
GND

* WIRING–WIND MONITOR–MA (MARINE VERSION)

AS ABOVE WITH FOLLOWING EXCEPTIONS ON WIND SENSOR INPUT

BLK
BLU
SHLD

REF
GND

SERIAL FORMAT SUMMARY – JUMPER W1	
FORMAT	JUMPER POSITION
ASCII TEXT	A
RMYT	A
NMEA	B
SOFTWARE	A / B

OUTPUT TYPE SUMMARY – JUMPER W2	
OUTPUT	JUMPER POSITION
SERIAL RS485	485
SERIAL RS232	232
VOLTAGE 0–5000 mV	VOUT

OUTPUT TERMINAL FUNCTIONS			
SELECTED OUTPUT	OUT 1	OUT 2	REF
RS485	(B)	(A)	REFERENCE
RS232	RECEIVE	TRANSMIT	REFERENCE
VOLTAGE 0–5000 mV	WIND SPEED 0–100 m/s	WIND DIRECTION 0–360°	REFERENCE
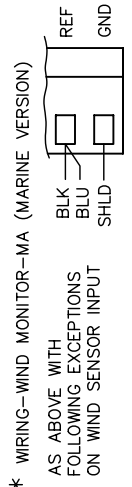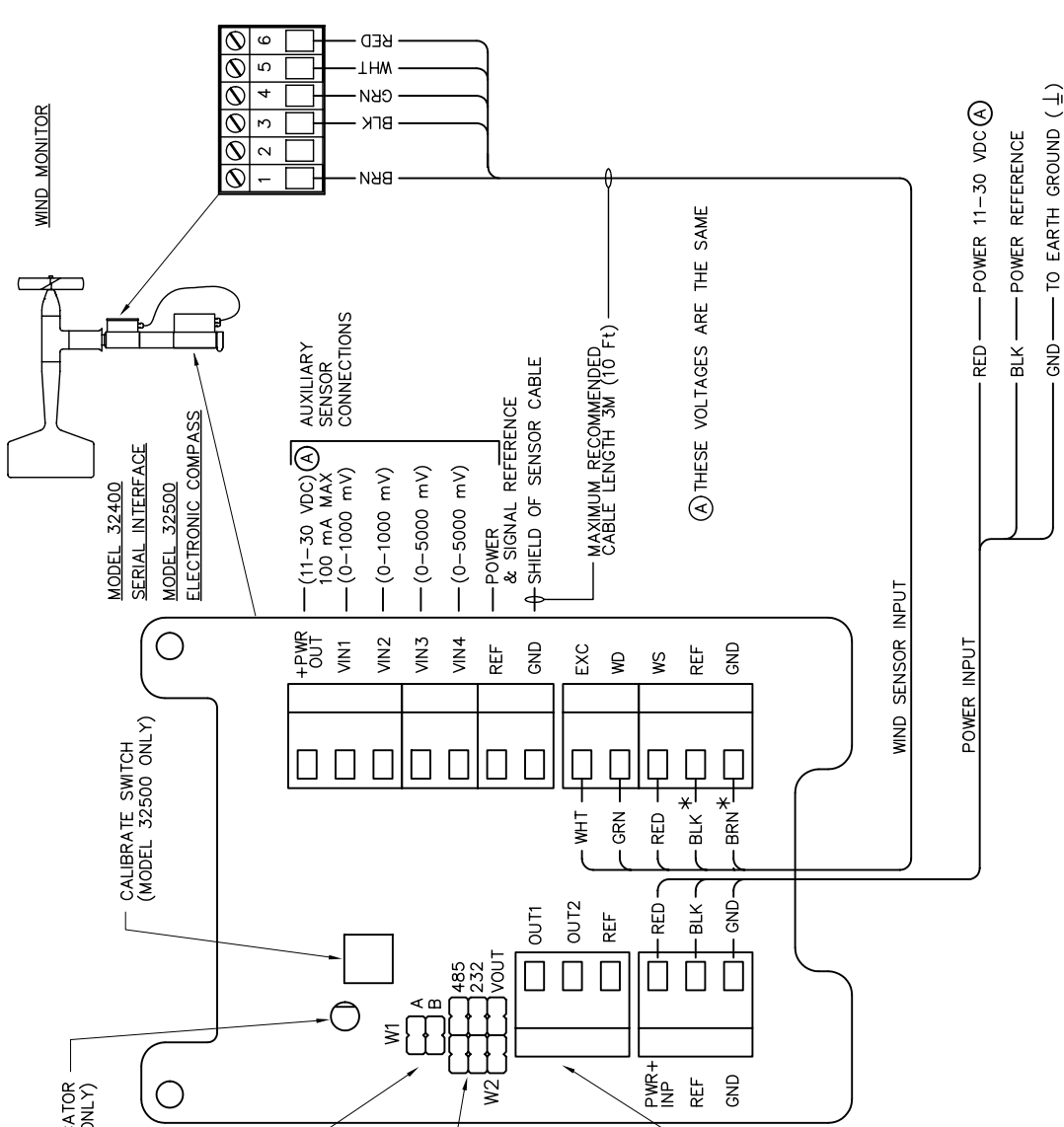
YOUNG

APPENDIX A

SERIAL OUTPUT WIRING DIAGRAMS

MODELS 32400/32500 USED WITH
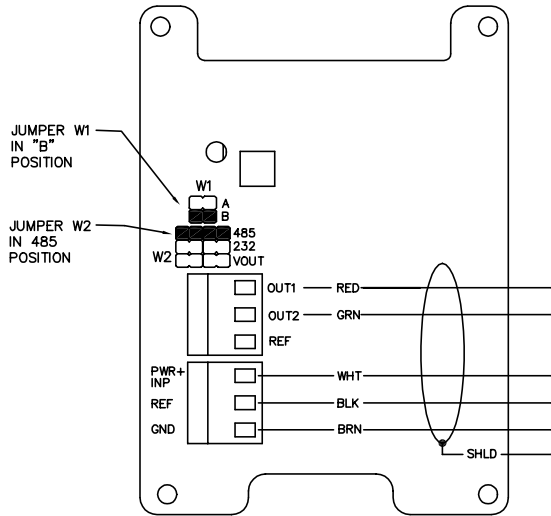YOUNG DISPLAYS — TRANSLATORS
OR WITH COMPUTER

MODELS 32400/32500

JUMPER W1
IN "A"
POSITION

W1
A
B

JUMPER W2
IN 485
POSITION

485
232
VOUT
W2

OUT1 —— RED
OUT2 —— GRN
REF

PWR+
INP
REF —— WHT
GND —— BLK
—— BRN

SHLD
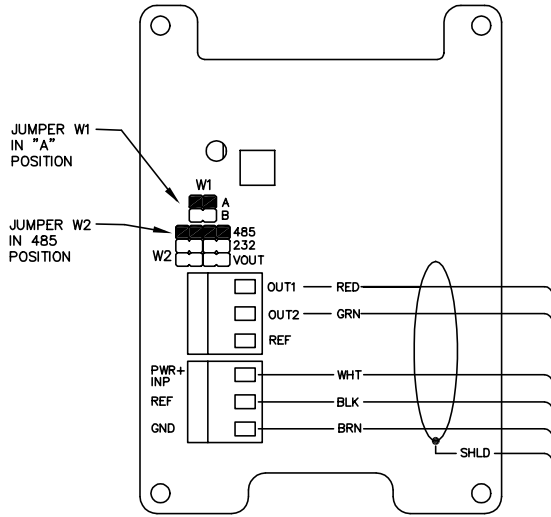
MODEL 06201 — WIND TRACKER

INPUT SETTING "09"

YOUNG   USA
MODEL 06201 WIND TRACKER
ALARM   0-5V OUT
SWITCH UP   WD WD WS WS   WS REF WD REF   INPUT POWER
FOR 4-20mA   12-30 VDC 4.5W

SWITCH
"UP"
POSITION

EXC WD WS REF GND   B A REF

SENSOR   RS-485

WHT   BLK BRN   GRN RED

TO OTHER
WIND TRACKERS

EARTH
GROUND

MODELS 32400/32500

JUMPER W1
IN "B"
POSITION

W1
A
B

JUMPER W2
IN 485
POSITION

485
232
VOUT
W2

OUT1 —— RED
OUT2 —— GRN
REF

PWR+
INP
REF —— WHT
GND —— BLK
—— BRN

SHLD
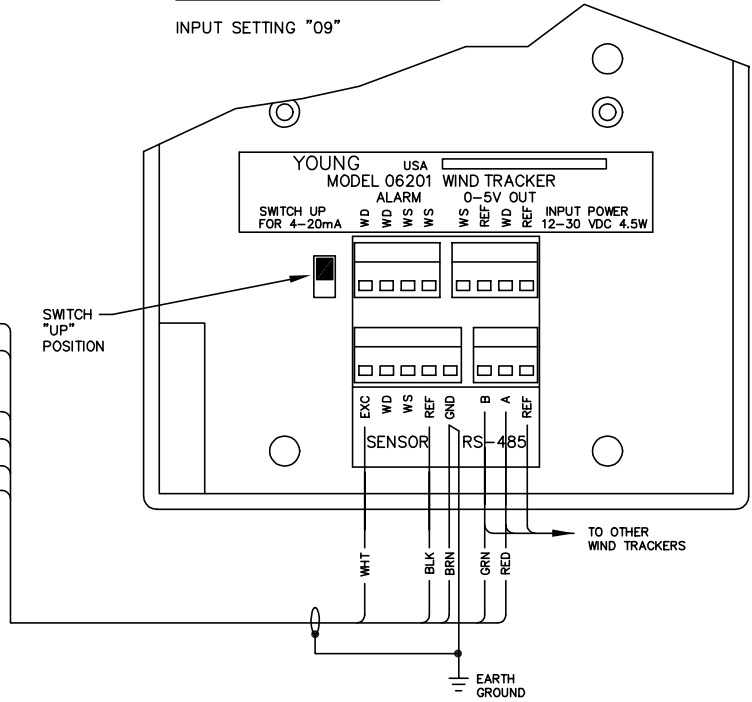
MODEL 06206 — MARINE WIND TRACKER

INPUT SETTING "SER"

YOUNG   USA
MODEL 06206 WIND TRACKER
ALARM   0-5V OUT
SWITCH UP   WD WD WS WS   WS REF WD REF   INPUT POWER
FOR 4-20mA   12-30 VDC 4.5W

SWITCH
"UP"
POSITION

EXC WD WS REF GND   B A REF

SENSOR   RS-485

WHT   BLK BRN   GRN RED

TO OTHER
WIND TRACKERS

EARTH
GROUND
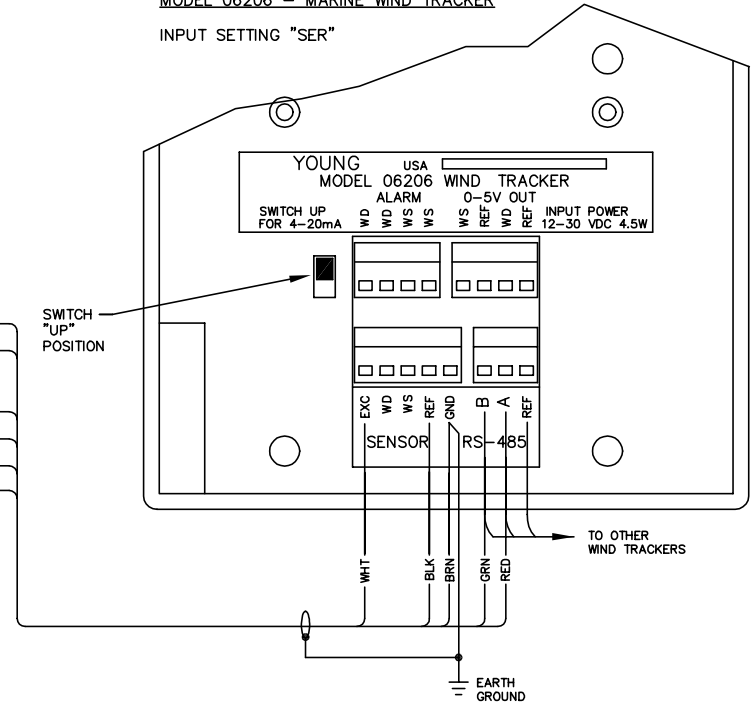
MODEL 26700 PROGRAMMABLE TRANSLATOR

INPUT INSTRUCTION: "INP SERIAL"
SET COMM/NUM ONLY INP: "YES"

32400/32500

RATE SERIAL OUTPUT: 2 Hz

JUMPER W1
NONE
INSTALLED

JUMPER W2
IN 232
POSITION

W1
A
B
W2 485
232
VOUT

OUT1 — RED
OUT2 — GRN
REF — BRN

PWR+
INP — WHT
REF — BLK
GND — SHLD

TEMP   WIND   ON   OFF   RS 232

+
−

POWER   EARTH
7−30VDC   GROUND

DB−9 CONNECTOR
FEMALE

RED → 3
GRN → 2
BRN → 5

5

7
8

1 6

9

5

WHT — POWER
11−30VDC
BLK — POWER
REFERENCE
SHLD — EARTH GROUND ($\perp$)

MODELS 32400/32500

JUMPER W1
NONE
INSTALLED

JUMPER W2
IN 232
POSITION

W1
A
B
W2 485
232
VOUT

OUT1 — RED
OUT2 — GRN
REF — BRN

PWR+
INP — WHT
REF — BLK
GND — SHLD

COMPUTER

FLOW CONTROL SET TO "NONE"

DB−9 CONNECTOR
FEMALE

RED → 3
GRN → 2
BRN → 5

7
8

1 6

9

5

DB−25 CONNECTOR
FEMALE

RED → 2
GRN → 3
BRN → 7

4
5

1 14

13 25

WHT — POWER
11−30VDC
BLK — POWER
REFERENCE
SHLD — EARTH GROUND ($\perp$)