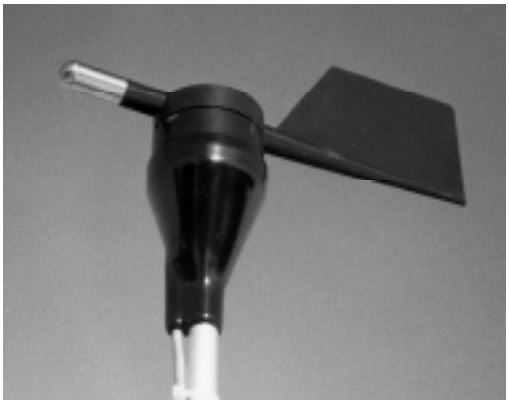
Comptus Inc ®

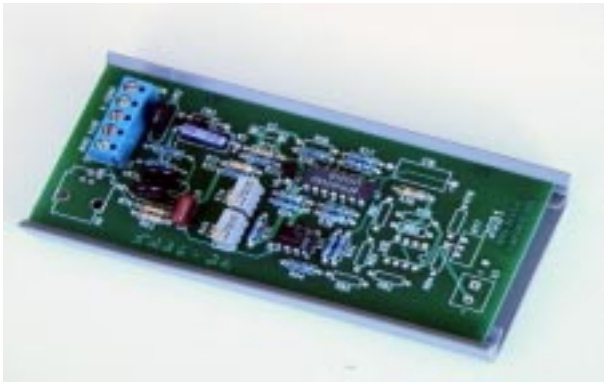
ISO 9001 Registered

INSTRUCTION MANUAL
for
WIND DIRECTION TRANSMITTER
MODEL A70-DL

DOCUMENT #1147 , Version H



A75-302 Wind Vane



Track Mounted Transmitter

Model A70-DL

__XX____ 360º Range _____ 540º Range

ISO 9001 Registered
Comptus Inc ® 342 Lyndeboro Rd., New Boston, NH USA
Phone: 603 487-5512 Fax: 603 487-5513 E-mail: sales@comptus.com

INTRODUCTION

The A70 Wind Direction Transmitter monitors wind direction and produces a proportional electrical output signal. The wind vane is balanced to prevent "parking" should the mounting not be level. The signal may be monitored by a computer, instrumentation or displayed on a meter.

The Transmitter converts the information from the sensor to a 4-20 ma signal proportional to wind direction.
An external source of excitation in the range of 12 - 24 VDC is required. Both operating power and output signal are provided by the same wire pair.

Two wind direction ranges, 0 - 360^{o} and 0 - 540^{o} are available. The 540^{o} range is recommended if a mechanical chart recorder will record wind direction. This range reduces transitions from zero to full scale when the wind is from the North, preventing the entire chart from being "painted." The 360^{o} range is recommended when wind direction is electronically recorded. The 360^{o} range provides the best resolution and the least cost. The 540^{o} range is best when abrupt transitions from zero to full scale are undesirable.

Figure 1
Recorder Trace with Predominate North Wind

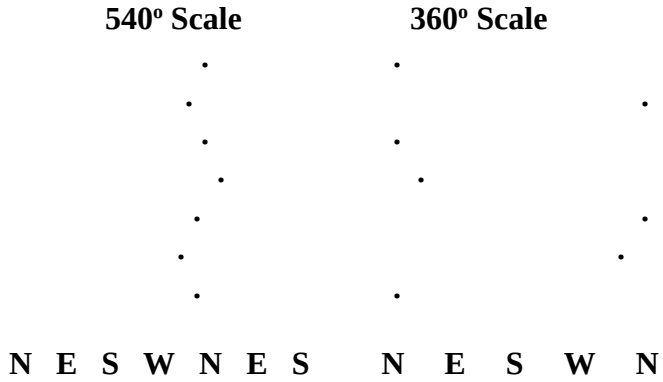
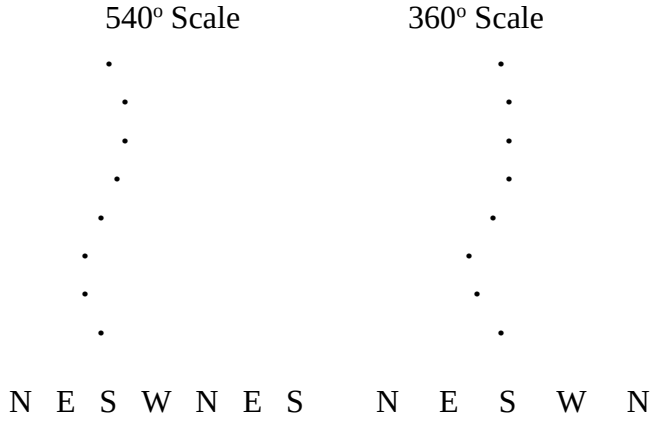


Figure 2
Recorder Trace with Predominate South Wind



SPECIFICATIONS

Operating Power: 12 - 24 VDC 30 ma max.
Supplied by current loop

Input Device: Potentiometric Wind Vane
Comptus Model A75-302
Qualimetrics Model 2102
RM Young Wind Monitor

Output: 4-20 ma for 0-360 degrees
4-20 ma for 0-540 degrees

Accuracy: Electronics ± 1%
Sensor See Separate Specs.

Loop Resistance:
(Excit. Voltage - 9) X 50 ohms Max.

Temperature Range:
Electronics $0^{o}/60^{o}$ C standard.
$-20^{o}/70^{o}$ C extended.
Sensor See Separate Specs.

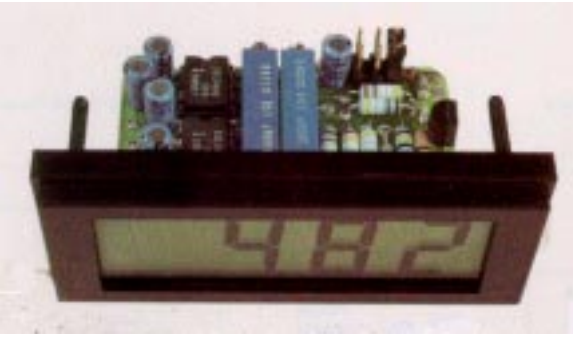
Dimensions:
NEMA 12 Box 3" W X 4.5" L X 11.5" D
Track Mount 2.25"W X 6" L X 1.5" D

Weight: Transmitter 8 lbs.

Connectors:
Barrier Strip to Accept Awg #14 or smaller wire

Accessories: A96 Lightning Arrestor
recommended for sensor protection

A70-LPDD
Loop Powered Digital Display



DataChart Electronic Chart Recorder

A70-LPDA
Loop Powered Analog Display

DESCRIPTION

The A75-302 Wind Vane is injection molded of black ultraviolet stabilized Lexan. The wind vane shaft is supported by two shielded stainless steel precision ball bearings. All materials are corrosion resistant. The sensor mounts on a .50" diameter mast. The sensor is supplied with an S-shaped aluminum mast and 60 feet of cable.

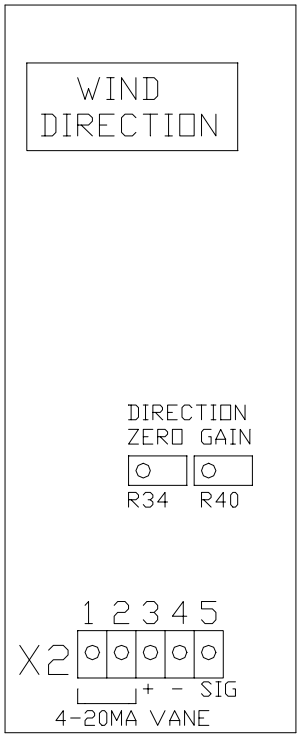
The wind vane is directly coupled to a precision conductive plastic potentiometer located in the main body. An analog voltage linearly proportional to wind direction is produced when a constant excitation voltage is applied to the potentiometer.

The Transmitter converts the output voltage from the wind vane, which is proportional to azimuth, to a dc current. The current varies linearly from 4 ma at zero degrees azimuth to 20 ma at 360 degrees azimuth. The Transmitter provides a regulated dc voltage for excitation of the wind direction potentiometer.

The Transmitter is loop powered and protected from damage by reverse polarity. All circuits are protected from damage by high voltage transients such as lightning by metal oxide varistors.

The Translator may be in one of several packages. It may be track mounted for installation in an existing enclosure. It may be supplied in a steel NEMA 12 JIC box for inside deployment or in a steel NEMA 4 box when a weather proof box is required.

Figure 3
Transmitter Component Layout



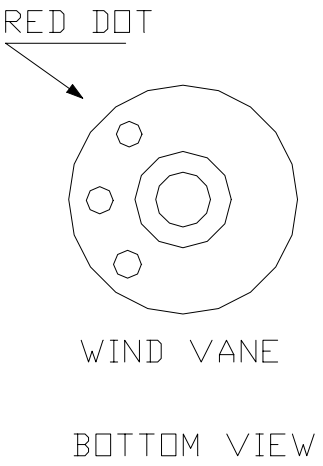


Figure 4
Direction Vane Mounting Diagram

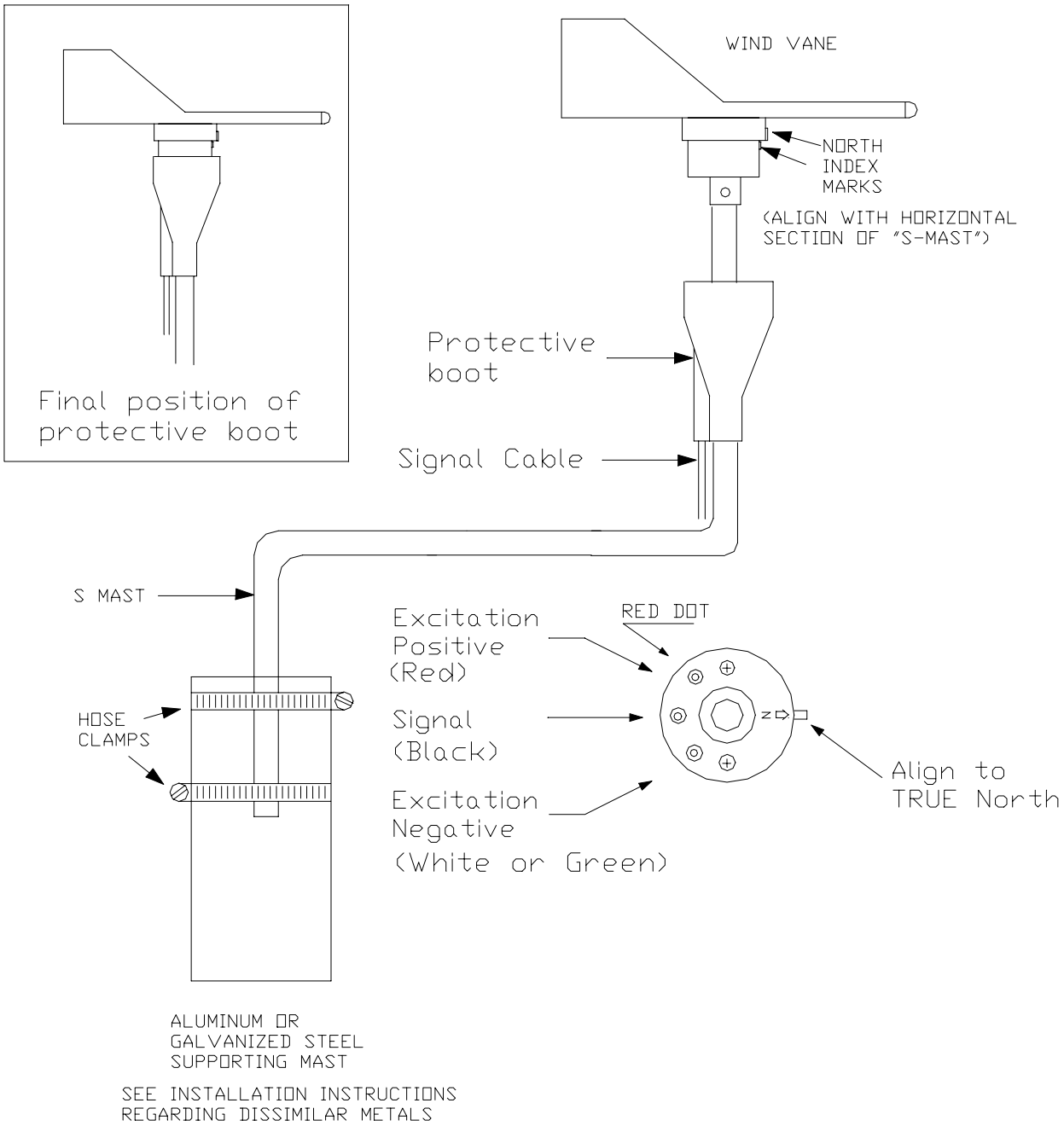


Figure 5
Transmitter Connection Diagram

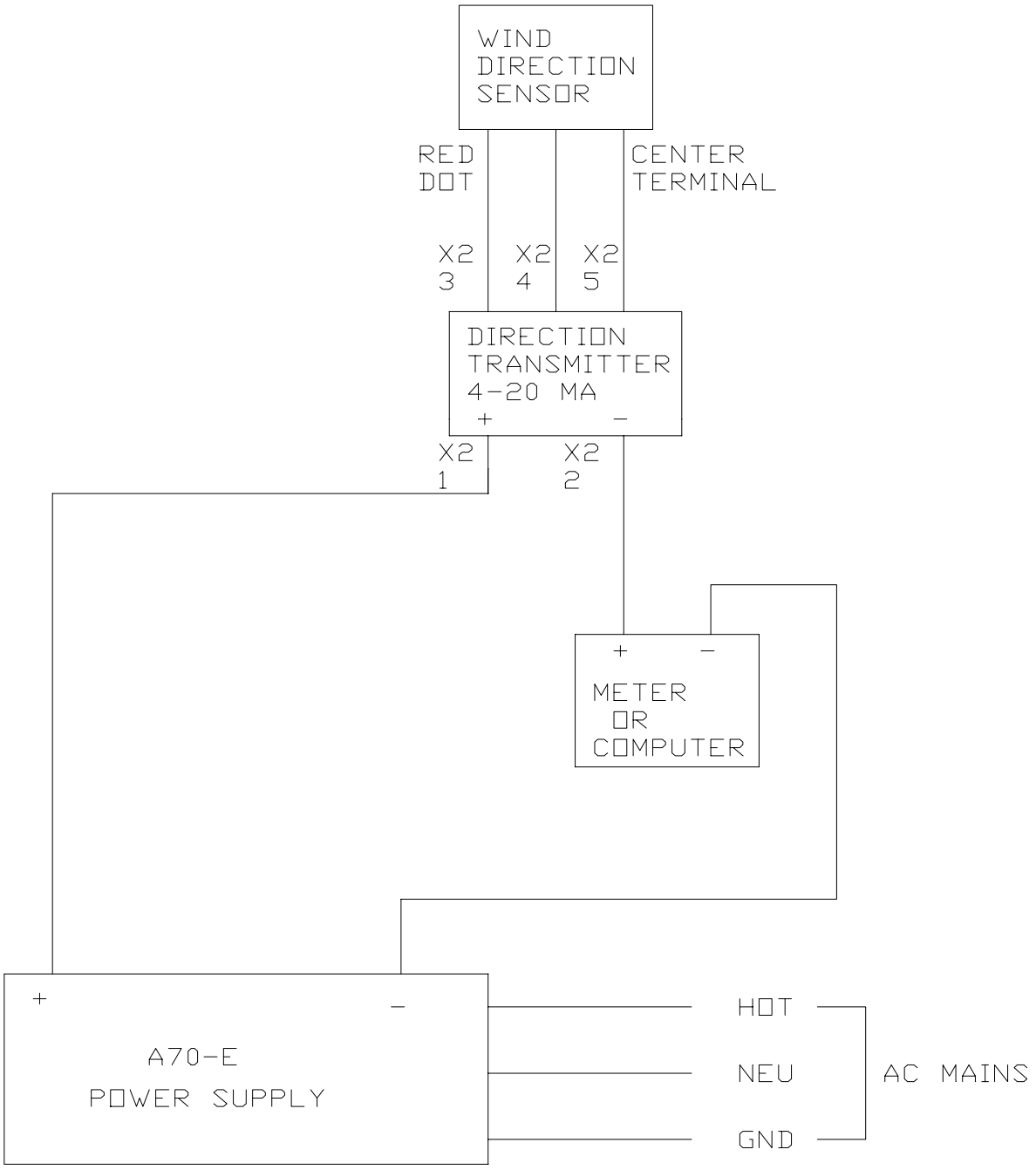
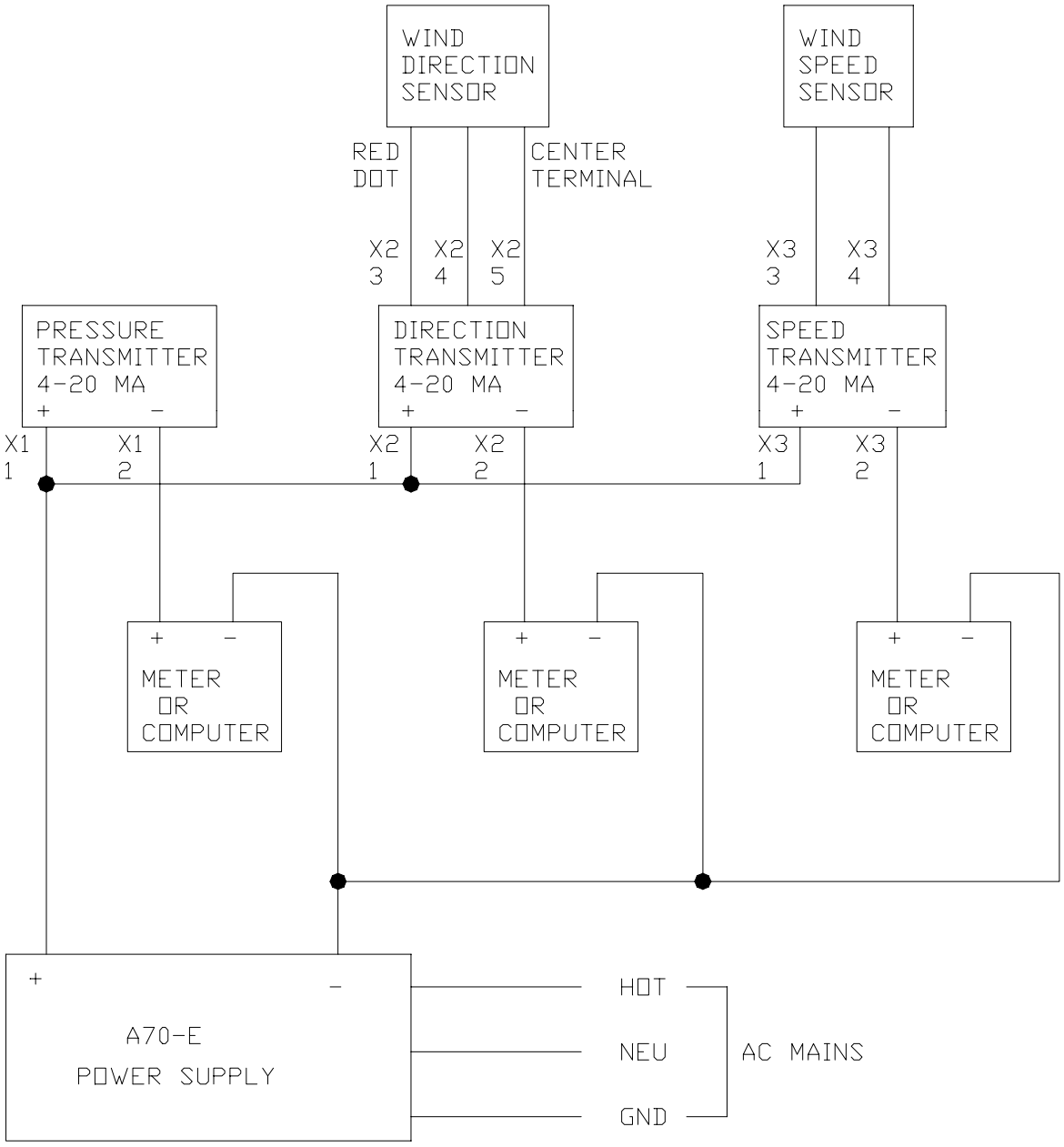


Figure 6
Multiple Transmitters with One Power Supply



INSTALLATION

Wiring Considerations

The wire type is noncritical for most applications. If the wiring is located in an electrically noisy environment, then the use of a twisted pair with shield is recommended. Connect the shield to ground at one end only. The insulation should be sunlight resistant. Polyethylene or polyvinyl chloride insulation is recommended.

Before proceeding verify that the maximum resistance of the current loop including the wiring and sensing element does not exceed the maximum given by Formula 1. If this resistance is exceeded the loop current will not attain full scale.

Formula 1
Maximum Loop Resistance

R - Maximum Loop Resistance in Ohms
V - DC Excitation Voltage

R = (V - 10 Vdc) X 50

The resistance of various gages of copper wire is given in Table 1.

Table 1

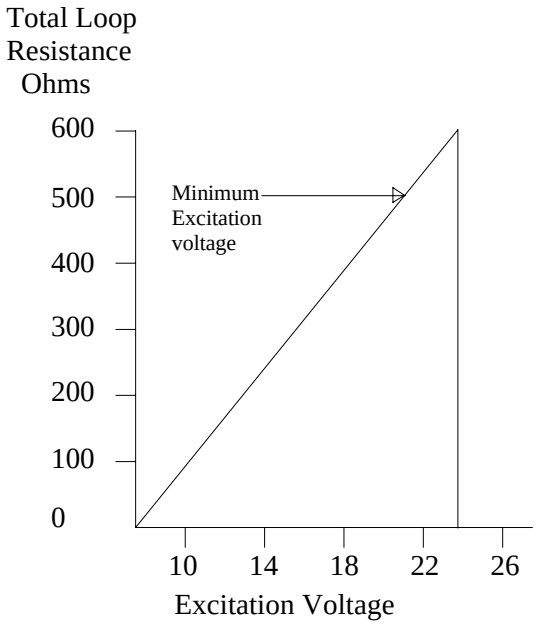
Wire Gage AWG	Resistance in Ohms per foot
12	.0016
14	.0026
16	.0041
18	.0065
20	.0103
22	.0165
24	.0262

A70-DL POWER SUPPLY

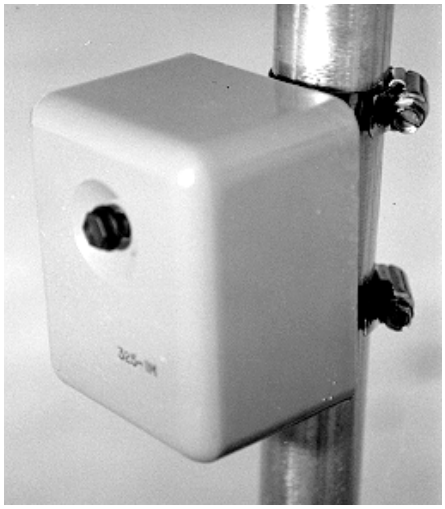
Proper operation of the Transmitter requires that the power supply provide a voltage in the range of 12-24 VDC. Voltage ripple must be less than 100 volts per second for proper operation. The Transmitter is designed so that the loop current will not exceed approximately 30 ma under any circumstances.

A 12 volt power supply can drive a current loop with a total resistance of 150 ohms. A 16 volt power supply can drive a current loop with a total resistance of 450 ohms.

Figure 7
Graph of Maximum Loop Resistance



A96-100P Surge Arrestor



Location

Do not install this equipment in the same enclosure with a liquid electrolyte battery unless ventilation is provided. Various gasses emitted from the battery will cause both premature and intermittent circuit failure.

Choose a protected mounting location for the Transmitter enclosure. Attach it to a back plane or other supporting structure. Special consideration must be given to installations where the sensors or electronics will be exposed to strong radio frequency radiation or strong magnetic fields. Contact the factory for applications assistance.

The wind vane should be mounted at the point at which it is desired to sample the wind. Typically, it is located as high as feasible and well clear of obstructions.

Do not mount the wind vane directly above a vertical wall as this location often has turbulent air flow.

It may be mounted on an existing structure, on a natural formation, or on a mast or tower. It is desirable to mount the vane so that the supporting structure will not influence the wind characteristics in its immediate vicinity. If the sensor is mounted above a roof top or similar building structure, it should be high enough so that the wind deflected off the structure will not affect it, typically 5 to 10 feet or more.

If mounted to the side of a supporting structure it should be mounted at least ten structure diameters away from the structure in order to take the sensor out of the disturbed air around the structure. It should be mounted toward the prevailing wind, and be positioned so that the influence of structural members is minimized.

A preferred mounting which is commonly used is a telescopic tower for installations up to forty or fifty feet high; a tower commonly used for TV antenna support, consisting of concentric pieces of tubing approximately ten feet long, guyed at each section, is suitable. Above this height self-supporting or guyed lightweight structural towers can be used.

If the “S” mast is to be mounted on a metallic tower consideration must be given to galvanic corrosion which occurs between dissimilar metals. Attachment to galvanized steel towers using stainless steel hose clamps is acceptable.

For other combinations of metals recommended practice is to electrically insulate the “S” mast from the tower with a plastic bushing or sheet. Alternatively fabricate a “S” mast from the same material as the tower. This consideration is especially important in locations exposed to salt spray and air.

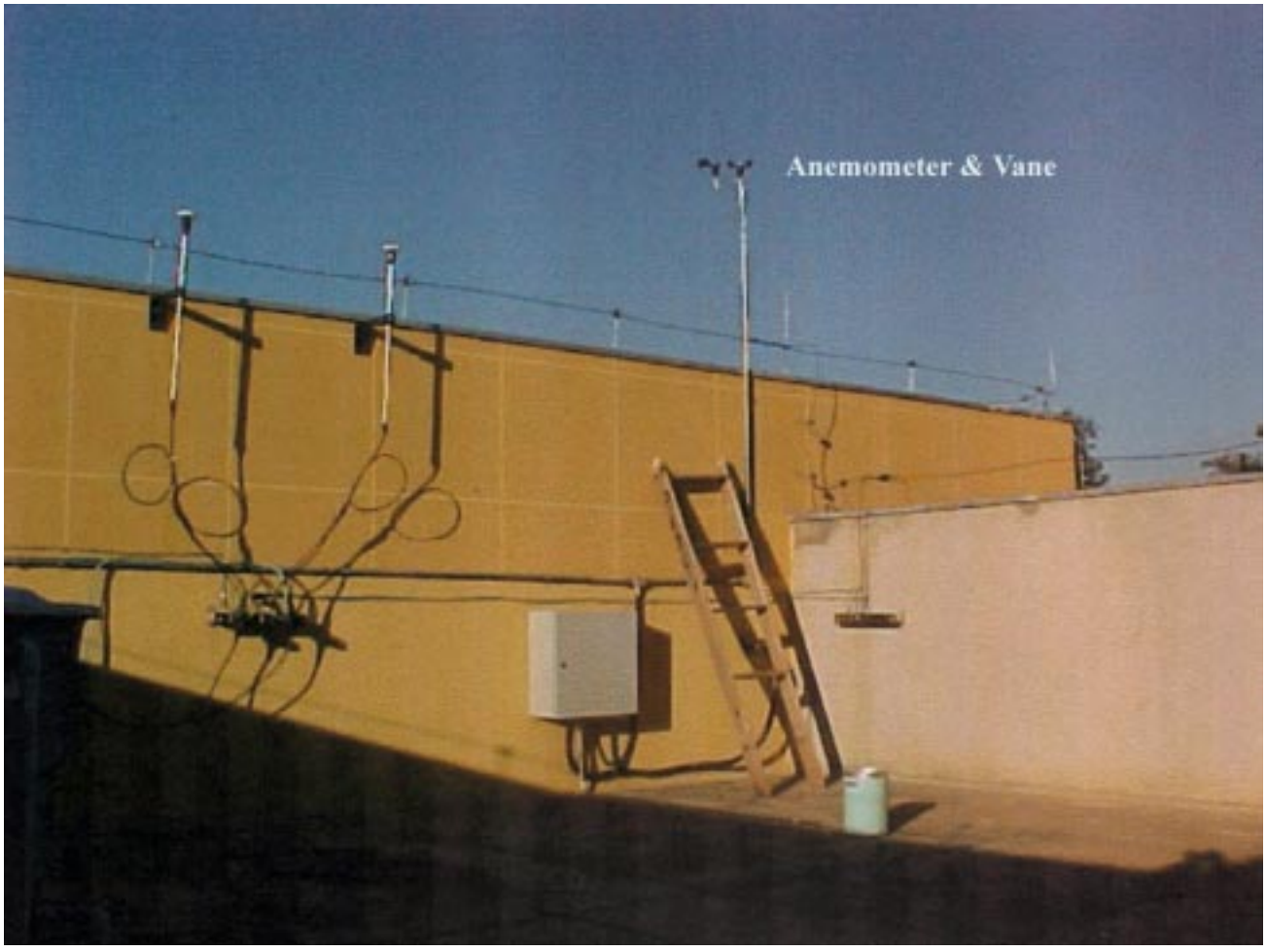
Lightning Protection

The Transmitter electronics has integral metal oxide varistors for protection from lightning induced surges, electrostatic discharge and other atmospheric discharges. Wind blown aerosols such as sand and snow can generate electrostatic charges with consequences similar to lightning discharges. The A96 Series of gas tube surge arrestors can safely dissipate much higher energy discharges than the internal varistors.

A consequence of the rapid rise time of these electrostatic discharges is the inductance of the grounding system and interconnecting wiring is generally of more concern than resistance. Gas tube surge arrestors should be placed as close to the device they are intended to protect to minimize the inductance in the wiring.

In highly exposed systems the sensors should be protected by gas tube surge arrestors located as closely as possible to them, typically 12 inches or less. The Transmitter electronics can benefit from another set of gas tube surge arrestors located where the sensor wiring enters the control building. Gas tube surge arrestors are indicated in any system with underground wiring.

Figure 8
Poor Wind Sensor Placement
Over Vertical Wall



Orientation

It is usually desirable to relate the wind direction readings to True North. If a magnetic compass is used the deviation from True North must be determined. A topographical map contains this information. For example if the deviation is 15 degrees West, a magnetic compass will indicate 15 degrees when pointed at True North. If the deviation is East, then subtract it from 360 to obtain the reading for True North.

The base of the wind vane has the letter "N" with an arrow molded into it. Refer to Figure 3. This must be oriented so that it is toward the North. The vane's mounting holes are oriented such that the "S" mast is on a North - South line with respect to the vane. For installations using large, climbable towers the vane may be oriented by pivoting the "S" mast in the hose clamps. For smaller towers pivot the entire tower until the "S" mast is properly aligned.

Do not press on the top of the vane as it may damage the bearings. To install the wind vane, grasp it about its lower body and press it with a twisting motion onto the mast. Align the 1/8" holes in the base of the wind vane with the holes in the "S" mast. Secure the vane to the mast by passing the cotter pin through the holes.

Slide the protective boot over the base of the wind vane after wiring is complete. Tape its base to the mast to secure it in place.

Wiring

Connect the end of the cable with the spade lugs to the sensor using a #4 nut driver.

It is recommended that the system be assembled and tested on the ground before final installation.

1. Select a suitable mounting location for the Transmitter.

2. Mount the instrument to a wall or other suitable panel using screws or bolts.

3. Refer to Figures 4 & 5 Connect the **Red** wire of the signal cable to the **Direction Vane Positive** terminal.

4. Connect the **Green** (or White) to the **Direction Vane Negative** terminal.

5. Connect the **Black** wire of the signal cable to the **Direction Vane Signal** terminal.

6. Connect the **Red** wire from the wind vane to terminal #3 marked "WIND VANE +".

7. Connect the **Black** lead from the wind vane to the terminal #5 marked "WIND VANE SIG".

8. Connect the **Green** (or White) lead from the wind vane to terminal #4, the remaining wind vane terminal.

9. Connect the Wind Direction current loop to terminals 1 & 2 in the DIRECTION section marked 4-20 ma. Observe polarity as marked.

Should additional cable be required up to 1000 feet may be carefully spliced into the existing cable. Take care to preserve the color code. AWG #18 - #22 stranded copper wire is recommended.

Secure the sensor cable to the supporting structure at intervals of four feet or less. If the cable is allowed to vibrate in the wind a broken cable may result.

OPERATION

Operation of the system is fully automatic and commences when loop power is supplied.

The wind direction vane has a 8 degree dead band centered about North. When in the dead band the output signal will be at its minimum.

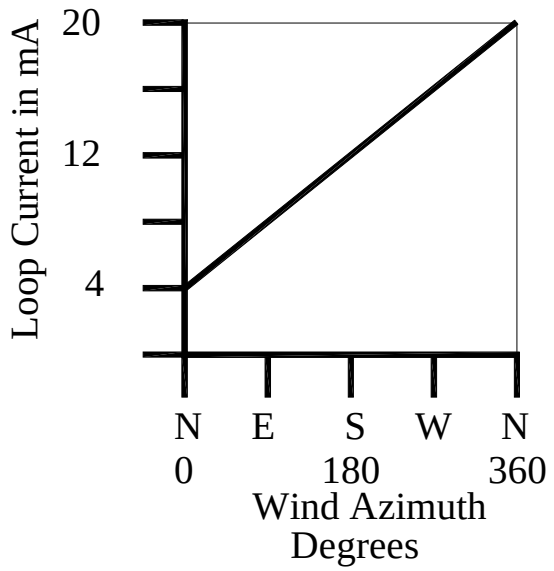
360 Degree Wind Direction Scale

The wind direction may be determined from the output current with the use of Formula # 2

D - Wind Azimuth in Degrees
I - Loop Current in ma

D = (I - 4) X 360/16 Formula #2

Figure 9
Graph of Wind Direction Transfer Function
360º Range



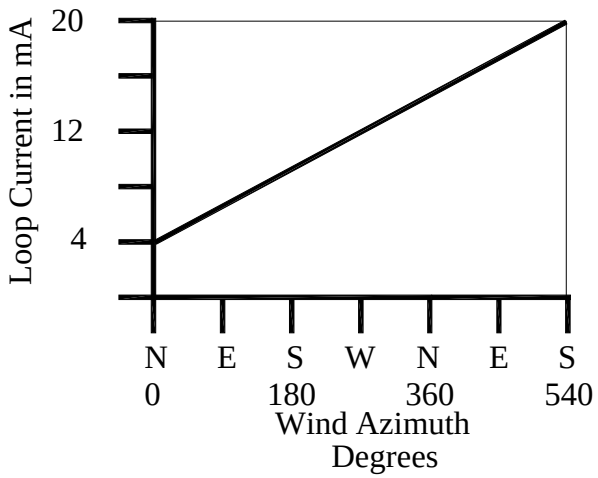
540 Degree Wind Direction Scale

The wind direction may be determined from the output current with the use of Formula # 3

D - Wind Azimuth in Degrees
I - Loop Current in ma

D = (I - 4) X 540/16 Formula 3

Figure 10
Graph of Wind Direction Transfer Function
540º Range

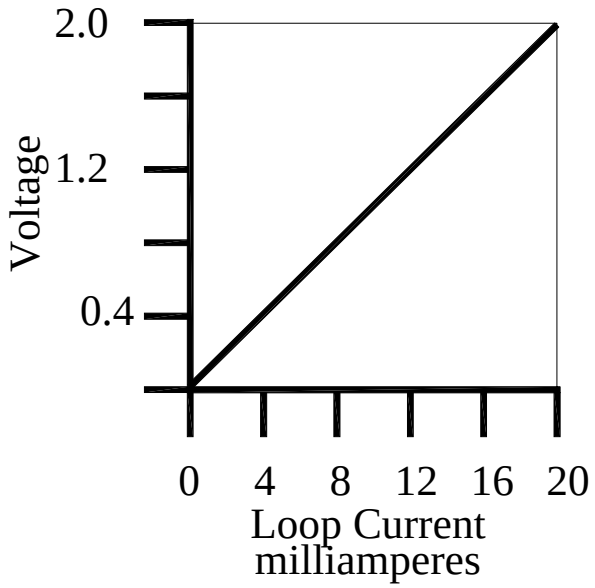


Voltage Across Sensing Resistor

I Loop Current in Milliamperes
R Resistance in Ohms
V Voltage in Volts

V = I X R / 1000 Formula 4

Figure 11
Current to Voltage Transfer Function for 100 Ohm Resistor



ICING

Under some conditions operation of the wind vane will be degraded by the presence of ice. This most often occurs as the result of freezing rain. The condition quickly clears when sunshine heats the wind vane causing the ice to melt. The condition may persist for hours or days in the absence of bright sunshine. No permanent damage is done to the wind vane . The Model 2450 is recommended for applications where icing is a concern.

Model 2450
Electrically Heated Wind Vane

MAINTENANCE

Direction Vane

The potentiometer should be replaced at intervals of two to four years or when the signal becomes noisy.

It is recommended that the sensors be checked for calibration each year. This can be accomplished by comparison with a portable anemometer or by wind tunnel testing.

Transmitter

It is recommended that the Transmitter be checked for calibration each year. Refer to Calibration section for details.

CALIBRATION

The instrument is fully calibrated at the factory before shipment. The following procedure is provided should adjustment be necessary in the future.

Gain & Zero Adjustments

Potentiometer R34 sets the wind direction zero. Potentiometer R40 sets the wind direction gain.

WIND DIRECTION

The adjustments may be sealed with electronic grade silicon rubber to prevent tampering by unauthorized personnel.

1. Connect a jumper between terminals 4 & 5 of the terminal strip marked “WIND VANE”. This simulates a signal corresponding to zero degrees of azimuth.

2. Adjust the potentiometer marked “DIR. ZERO” to produce a 4 ma loop current.

3. Connect a jumper between terminals 3 & 5 of the terminal strip marked “WIND VANE”. This simulates a signal corresponding to 359 degrees of azimuth.

4. Adjust the potentiometer marked “DIR. GAIN” to produce 20 ma of loop current.

TROUBLE SHOOTING

INCORRECT DIRECTION INDICATION

Check the response with wind vane orientations of North, South, East and West. The Northern orientation is produced when the vane is aligned with the mark on the edge of the housing.

If the output is correct for the Southern orientation, but incorrect for East and West, then the positive and negative excitation terminals are interchanged.

If the output signal is active for only half of the range, then the signal terminal and one of the excitation terminals are interchanged.

If the output constantly indicates just West of North, then the negative excitation connection is open or the signal terminal is short circuited to the positive excitation terminal.

If the output is constantly just East of North then the positive excitation terminal is open or the signal terminal is short-circuited to the negative excitation terminal.

Loop Current	Failure Description
0 ma (constant):	Current loop polarity reversed Open circuit in cable Power supply failure
4 ma (constant):	Open in Positive or Signal wire connecting wind vane to transmitter Wind vane potentiometer open
20 ma (constant):	Open in Negative wire connecting wind vane to transmitter
Less than 4 ma:	Low power supply voltage Loop resistance too high
Greater than 20:	Short circuit in cable
Does Not Reach 20 ma, otherwise operates properly:	Low power supply voltage Loop resistance too high

DIRECTION VANE TESTING

The potentiometer in the direction vane has a nominal resistance of 10000 (10K) ohms.

With the signal cable to the direction vane disconnected from the transmitter an ohm meter may be used to measure approximately 10000 (10K) ohms resistance between the (+) & (-) excitation terminals.

The resistance between the direction vane signal lead and either of the excitation terminals should be less than 10000 (10K) ohms.

If the resistance values differ radically from the above then the vane or the signal cable likely contains a fault.

The signal lead of the wind vane will indicate an open circuit if the vane is positioned in the dead band which is centered about North.

DIRECTION VANE SIMULATION

The wind vane may be simulated using a potentiometer with a nominal resistance of 10000 (10K) ohms.

Trouble Shooting Philosophy

Effective trouble shooting requires that problem locations be systematically eliminated until the problem is found.

There are four basic questions to answer when trouble shooting (Ref. #1):

1. Did it ever work right?

2. What are the symptoms that tell you it's not working right?

3. When did it start working badly or stop working?

4. What other symptoms showed up just before, just after, or at the same time as the failure?

It is best to write down any clues you may obtain. Be sure to write down anything unusual.

The response to question #3 should probably not be 3:04 P.M.. A useful response might be, "Just after an electrical storm." or, "Just after it fell off the shelf."

Double check all the simple solutions to the problem before searching for complex ones. If the problem occurs right after installation, it probably has a simple solution.

If an automobile engine cranks, but doesn't start, make sure there is fuel in the tank before replacing the engine. If the electronic equipment doesn't function verify that it has power and is turned on.

Systems containing parts which can be quickly interchanged are easy to trouble shoot. Swap parts until the problem moves. The location has then been narrowed to the part that caused the problem to move.

Sometimes there are multiple problems. These reveal themselves in layers much like peeling an onion.

It often helps to explain the problem to another person, even if that person is not knowledgeable about the particular piece of equipment.

This does two things. First it requires you to organize the situation so it can be explained to another. Secondly, it may turn out that you are so familiar with the situation that you have overlooked the obvious. Another person unfamiliar with the equipment may be able to help.

If you are unable to solve the problem, put it aside until the next day. Some new thoughts will probably occur while working on another project.

References

1. "Troubleshooting is More Effective with the Right Philosophy", Robert A. Pease, Electronic Design News, January 5, 1989.

LIMITED WARRANTY

COMPTUS INC. extends this warranty to the original consumer only. Any product manufactured by Comptus is warranted against defect for a period of ONE YEAR beginning on the date of purchase by the consumer or two years beginning on the date of purchase from Comptus by the authorized dealer, whichever expires sooner.

TO OBTAIN WARRANTY SERVICE, the purchaser must contact Comptus and receive return authorization. Such correspondence should be addressed to: Comptus INC., 342 Lyndeboro Rd., New Boston, N.H. 03070. All warranty service is performed at the factory. All incidental expenses, including shipment of products to Comptus by the purchaser, shall be the sole responsibility of the purchaser. WARRANTY SERVICE is at the sole discretion of Comptus and free of charge for parts and labor. Under the above terms, Comptus will repair or replace the defective component(s), provided that:

a) the product has not been subjected to abuse, neglect, accident, alteration, improper installation or servicing, or used in violation of instructions furnished by Comptus;

b) the product has not been repaired or altered by anyone except Comptus or its authorized service agencies;

c) the serial number has not been defaced, removed, or otherwise changed;

d) the damage has not been caused by acts of nature including windstorm and hail beyond those specified as within the range of operating conditions;

e) the damage has not been caused by shipping.

THIS WARRANTY IS IN PLACE OF ALL OBLIGATIONS OR LIABILITIES ON THE PART OF COMPTUS FOR DAMAGES. IT DOES NOT APPLY TO ANY COMPONENT OR EQUIPMENT RESOLD BY COMPTUS IN ITS ORIGINAL CONDITION AS RECEIVED BY COMPTUS FROM THE MANUFACTURER OR DISTRIBUTOR, AMONG THE DAMAGES EXCLUDED FROM THIS WARRANTY ARE ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE PRODUCT IN ANY WAY. Any implied warranties are limited in duration to the duration of the written warranty. No representative or person is authorized to give any other warranty or assume for Comptus any other liability in connection with the sale of its products.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATIONS AND/OR EXCLUSIONS MAY NOT APPLY TO YOU. This warranty complies with the Magnuson-Moss Consumer Warranty Act, and completely replaces any warranty printed on promotional material describing products of Comptus Inc.

HOW TO RETURN EQUIPMENT TO COMPTUS

1. Contact the Comptus Service Department with the model and serial number of the unit. Be prepared to provide the symptoms of the problem as many are solved without the need for returning the equipment. Have a person with firsthand experience of the trouble on hand to provide specific information.

2. Comptus will issue a Return Material Authorization Number (RMA #) if required. This will ensure the fastest response and least cost for all parties. Please reference this number in all correspondence. This number should be printed on the shipping container.

3. Include a description of the service desired with the returned equipment. If the equipment is being returned for repair, please include a description of the problem.

4. If the equipment is packaged in a plastic case, wrap it in aluminum foil or other conductive material. This will protect it from static electricity, as well as prevent the packing material from jamming mechanical parts, such as switches.

Otherwise, place the equipment in a plastic bag, again to prevent contamination by packing material.

Place the equipment in a suitable shipping container and fill with packing material. There should be at least one inch of packing material between the equipment and the shipping container on all sides.

5. Equipment will be returned C.O.D. to sender if any charges are incurred, unless other arrangements are made in advance.

SHIP THE EQUIPMENT TO:

Comptus Inc.
342 Lyndeboro Rd.
New Boston NH 03070 U.S.A.

Telephone: 603 487-5512
Telfax: 603 487-5513
Email: service@comptus.com

NOTE: Please be sure to include the RMA Number, as described in Item 1, on the shipping container.

Model A70-DL
Component Packing List

Quantity	Description	Quantity Received
1	A70-DL Translator	_____
1	Direction Vane	_____
1	S Mast	_____
1	60 ft., 3 Cond. Cable	_____
1	Protective boot	_____
1	Instruction Manual	_____
2	Hose Clamps	_____
1	Certificate of Calibration	_____

IMPORTANT: Please check your order on receipt to be certain all listed accessories are included before discarding shipping container or packing material. All shortages must be reported within 10 days of receipt.