

INSTRUCTION MANUAL



011 Comax Weather Station

C a m p b e l l S c i e n t i f i c , I n c .

011 COMAX WEATHER STATION

REVISION: 9/91

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SECTION 1. WEATHER STATION DESCRIPTION AND INSTALLATION

The Comax Weather Station is designed to provide the data outputs needed for the Gossym COMAX Software. Installation is simplified through a modular design and pre-wired sensors. This manual covers installation, sensor options, maintenance, and trouble shooting.

1.1 STANDARD SENSORS

Sensors with pre-assigned channels include:

- wind speed
- wind direction*
- temperature
- solar radiation
- rainfall
- moisture detection
- relative humidity*
- soil temperature*

* These sensors are optional and are referred to throughout the manual as if the user has them. Please disregard any reference made to these sensors if they are not installed.

1.2 TOOLS AND SUPPLIES

TABLE 1.2-1. Tool Requirements

- screw driver, regular head	- compass
- tape measure	- wire strippers
- screw driver, phillips head	- shovel
- sledge hammer	- level
- open end wrench 3/4"	- wheelbarrow
- wood saw	- hammer
- trowel (for cement)	- rag
- flat metal file	
- dozen 16 penny nails	
- screw driver, regular head thin blade	

Tables 1.2-1 and 1.2-2 show an itemized list of tools and supplies required to install the weather station.

TABLE 1.2-2. Material Requirements for Constructing Foundation

- 5 80 lb. sacks of sakrete
- 1 8' x 2" x 4" lumber
- 1 1/4" diameter x 3 1/2' long pipe (solar panel systems only)
- *11" x 11" metal template
- *4 1/2" x 12" stainless steel anchor bolts
- *1" conduit elbow

*CSI supplied

1.3 FOUNDATION CONSTRUCTION

The Comax Weather Station mounts on a cement foundation as shown in Figures 1.3-1 and 1.3-2. CSI provides a (1) metal template for locating the anchor bolts and conduit in the base, (2) four anchor bolts with two nuts each for leveling the station, and (3) a conduit for communication wire entry/exit at the base.

Step 1 - Dig an 18" square hole that is 12-13" deep. These estimates are for heavy soils only; light, shifting, or sandy soils require a deeper base (and more cement). Excavate a slot for the conduit elbow at about 9" below the surface on the side where the communication cables will enter. The slot should be oversized, making it easier to install the conduit (Step 3).

Step 2 - Construct a wood form for the above ground portion of the foundation. If the surface area of the hole is 18", cut two 18" and two 21 1/2" boards from the 8' 2 x 4. Nail the boards together to make an 18" (inside dimension) square form. Center the form over the hole.

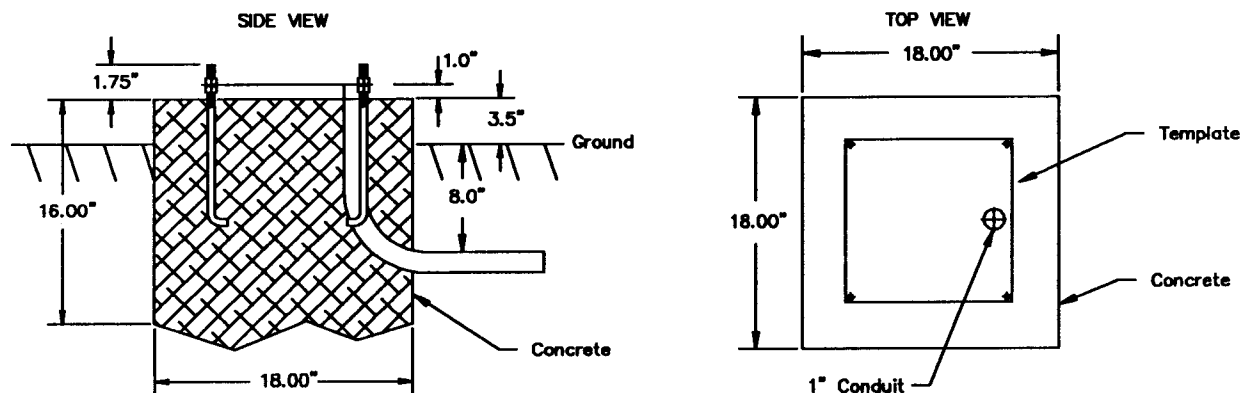
Step 3 - Three cubic feet of cement are required to fill a 18" x 18" x 16" deep hole. This amounts to approximately five (5) eighty pound (80 lb.) sacks of sakrete. Mix the cement. Stuff a rag into one end of the conduit elbow to prevent cement from clogging the conduit. While holding the conduit in place, pour the cement. Examine the template to judge where to position the top of the conduit. About 1.5 inches of conduit should be exposed above the cement surface.

Step 4 - While the cement is setting, assemble the template and anchor bolts as shown in Figure 1.3-3. Set the anchor bolts and template in the cement so the conduit is coming through the conduit hole in the template. The threaded end of the anchor bolts should extend a minimum of 1 3/4" above the top of the concrete. This allows the template to rest on the lower set of nuts about 1" above the surface of the concrete (Figure 1.3-1). Adjusting the lower set of nuts

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allows you to level the template and later the Comax Weather Station. Do not remove the template. It is used as the bottom for the pedestal base when the weather station is assembled.

Step 5 - Weather stations using a solar panel for charging the battery need to insert a user supplied 1 1/4" pipe into the cement pad (Figure 1.3-2).



NOTES

1/2"x12" stainless steel anchor bolts extend a minimum of 1-3/4" above concrete.
Footing is 18"x18"x16" deep (five 80# sacks of SAKRETE) for heavy soils.
Footing depth should be increased for light, sandy or shifting soils.

FIGURE 1.3-1. Comax Foundation Construction

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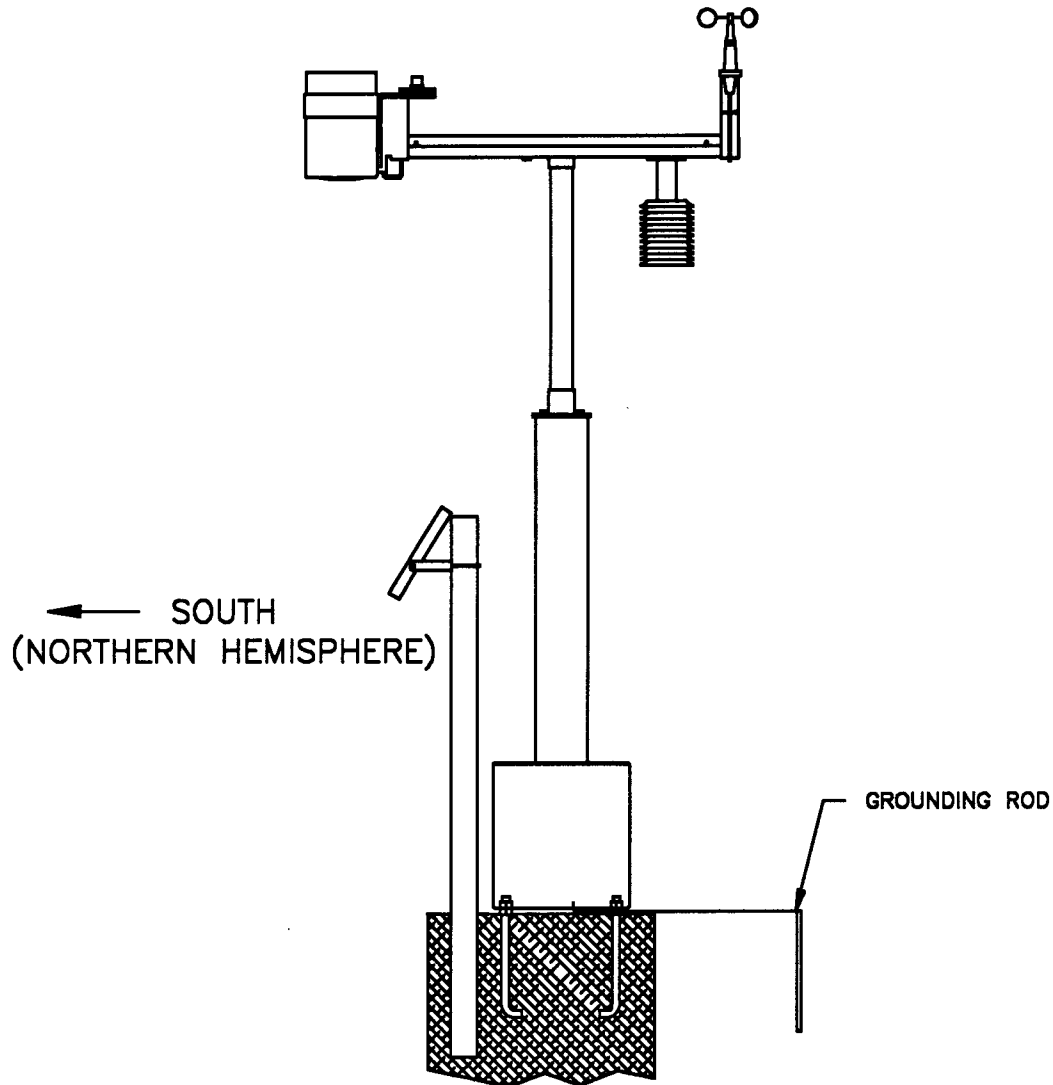


FIGURE 1.3-2. Comax Weather Station with Solar Panel

1.4 WEATHER STATION ASSEMBLY

The following instructions describe the installation of the Comax Weather Station. All steps **except** those marked with an asterisk (*) are shown in Figure 1.4-1.

Before assembling the threaded ends of the mast, apply the teflon pipe dope provided with the weather station to prevent the aluminum from galling.

Step 1 - Thread the cables from the canister through the mast and hand tighten the mast to the canister. Do not twist the cables.

Step 2 - Remove the crossarm cover. Thread the cables through the center hole of the crossarm and screw the crossarm to the mast.

Caution: Over-tightening the mast will cause excessive torque.

Step 3 - Mount the weather station on the cement pad aligning the conduit with the conduit notch in the bottom of the pedestal. Vertically plumb the weather station by adjusting the upper and lower nuts that secure the pedestal base to the anchor bolts.

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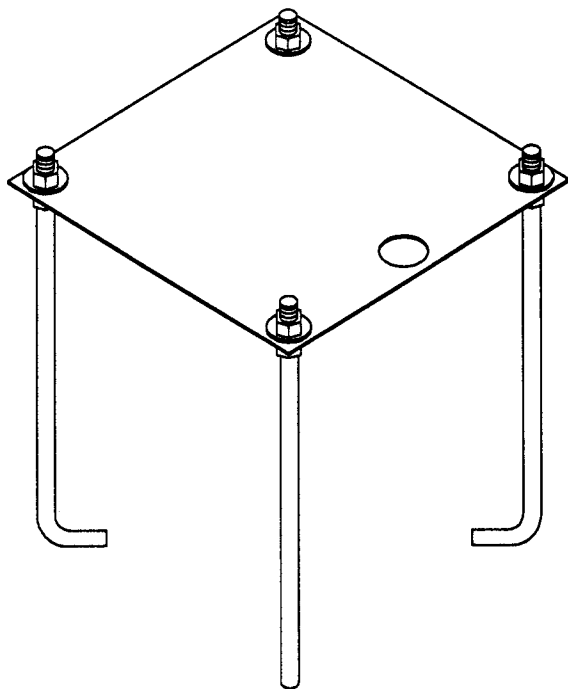


FIGURE 1.3-3. Template and Anchor Bolt Assembly

***Step 4 -** (Figure 1.4-2) Tighten the crossarm and mast as much as possible while aligning the crossarm north-south. The crossarm end having a 1 5/8" hole on the underneath side must be pointed north. Use of a compass is recommended as the crossarm orientation affects the accuracy of the wind direction measurement.

Step 5 - Mount the wind sensors on the north end of the crossarm using the brackets provided. The windset crossarm should be oriented east-west, with the wind direction sensor oriented to the east (Figure 1.4-2).

For stations which measure wind speed only, the wind speed sensor may be mounted on either end of the windset crossarm. A small square metal piece is provided to fill in the area left vacant for the wind direction sensor.

Step 6 - Mount the solar radiation and rain gage sensors on the south end of the crossarm.

NOTE: Insert the sensor cables through the grommated slot before attaching sensors to the crossarm.

Level the radiation sensor using the 3 adjustment screws and the fixtures bubble level.

NOTE: Accurate radiation measurements require accurate leveling.

Remove the top of the rain gage and make sure that the bucket is not dead center, but tipped to one side. Manually tip the bucket, checking that it tips freely to both sides. Replace and level the lid.

Step 7 - Mount the radiation shield into the 1 5/8" diameter hole on the underneath side of the crossarm. The lowest louver of the radiation shield should be 4 ft. 9 in. above the ground in order to place the temperature sensor at 1.5 meters. Put the temperature sensor into the radiation shield making sure that the temperature sensor is properly seated into the radiation shield.

Step 8 - Attach the lightning rod to the 1 1/4" sleeve on the underneath side of the crossarm.

***Step 9 -** The Serial (I/O) cable is mounted on the underside of the crossarm, near the mast. Remove the screws, insert the 9 pin D connector and then replace the screws.

NOTE: The cover lid is held in place by a long bolt. Make sure that the cover plate is in place before tightening the screws.

Step 10 - Route the windset cables through the bottom of the crossarm. Make sure the cables pass through the grommated slot.

***Step 11 -** Note the labeling on the sensor leads and connect the sensor cables to the appropriate canister cables. Arrange the connectors so they do not interfere with the crossarm cover. Tie down all sensor leads with the nylon ties provided in the ends of the crossarm. Replace the crossarm cover using the six screws.

***Step 12 -** Double check the weather station, to make sure that the solar radiation and rain gage sensors are level. Also check to see that the wind direction sensor is mounted on the east side of the crossarm.

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Step 13 - Proper grounding of the station is required to minimize damage from transients caused by lightning strikes or other voltage surges. Drive the copper plated ground rod into the earth adjacent to the weather station and attach the ground rod clamp. A 12 AWG green grounding wire is connected to a ground lug on

the base. Connect the free end of the green wire to the ground rod clamp. This important step grounds the communications modem, the weather station, and the CR10 datalogger.

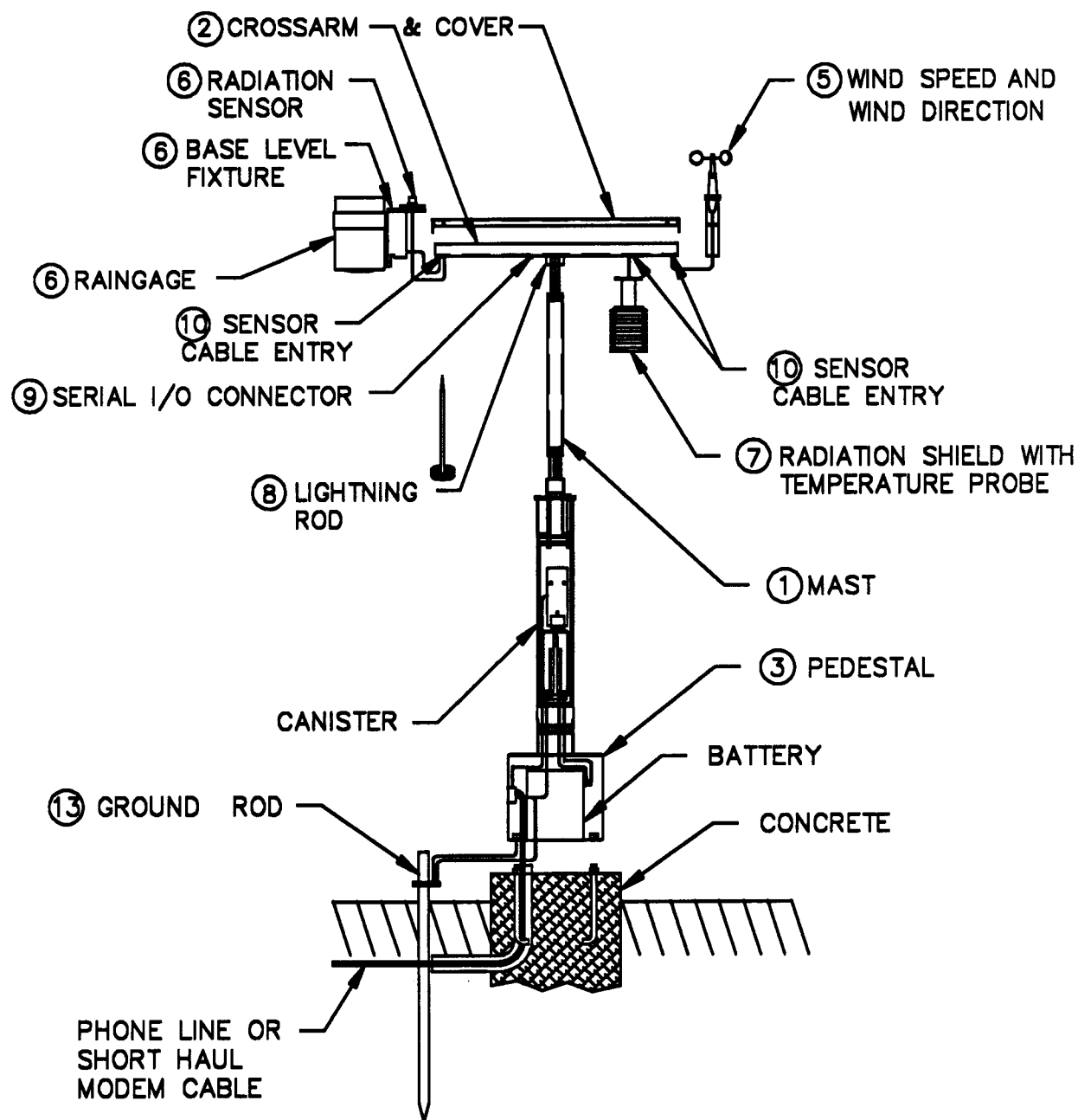


FIGURE 1.4-1. Comax Weather Station Assembly

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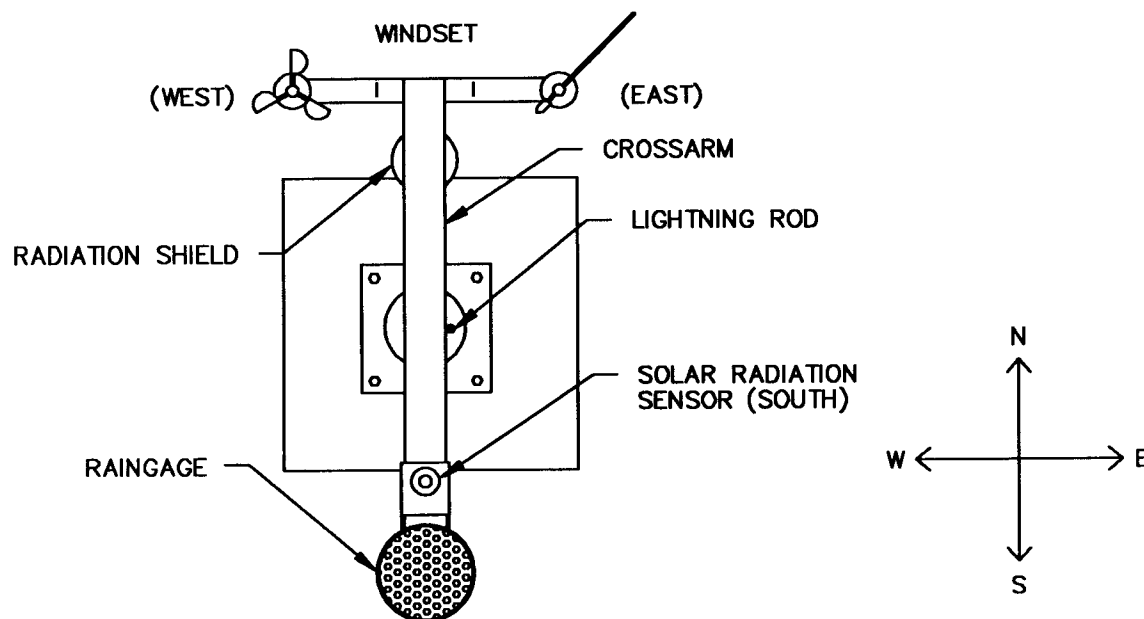


FIGURE 1.4-2. Wind Set Alignment

1.5 POWER SUPPLY INSTALLATION

1.5.1 BATTERY INSTALLATION & REPLACEMENT

NOTE: The Comax Weather Station base is at power ground. When installing the battery on the template inside the base, take care not to short the positive post of the battery to the base.

The battery may be continuously charged or periodically exchanged. To install a battery, locate the terminal block inside the base of the pedestal where power supply connections are made (Figure 1.5-1). Connect the battery to the terminal labeled "Batt 12V".

Connect a user supplied battery with one of the two power cables provided. Connect the cable to the "BATT 12V" red positive, black negative terminal block first, then connect to the battery.

Battery Replacement

The battery should be replaced when discharged below 10.5 volts (Sections 1.7 and 2.5). The

second set of battery cables are provided for exchanging batteries without interrupting power to the CR10 Datalogger. Leave the old battery connected until the new battery is connected. Connect the cable to the "AUX BATT 12V" terminals first, then the circular lugs of the battery. Disconnect and remove the old battery. Store the cable until needed for the next battery change. **Never leave a battery cable connected to the power strip with the circular lugs dangling.**

WARNING: If the 12V power is disconnected from the weather station, the data in the datalogger is lost.

Solar Panel

The solar panel is mounted (Figure 1.3-2) on the south side of the weather station (Northern Hemisphere only) and connects to the terminals labeled "INPUT EXTERNAL CHARGING SOURCE". In order for the Solar Panel to charge the batteries, be sure that the battery leads are connected to the terminals labeled "12V BATT". The battery will not be charged if it is connected to the "AUXILIARY BATTERY" terminal.

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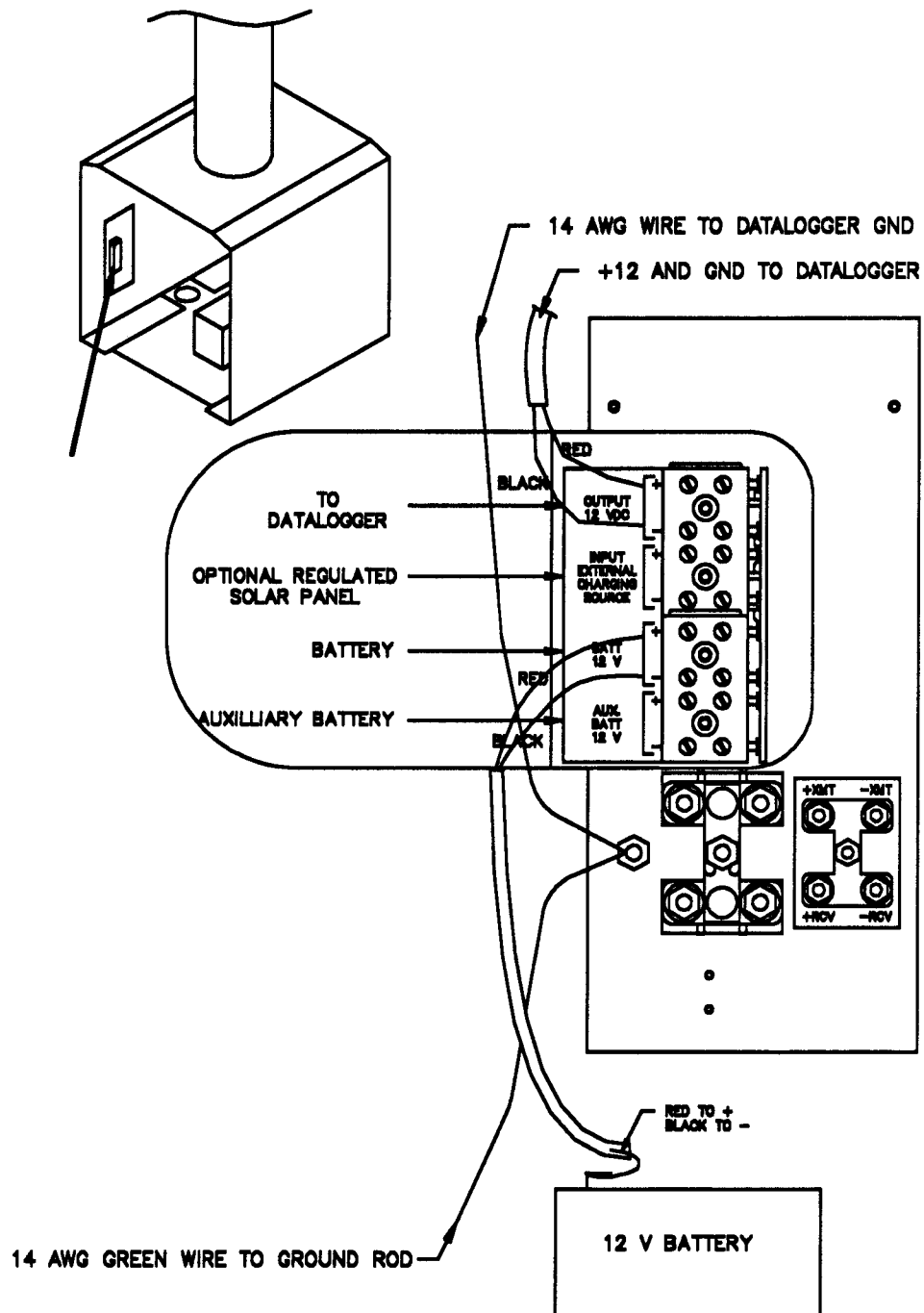


FIGURE 1.5-1. Battery/Solar Panel Connections

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1.6 DATA RETRIEVAL OPTION INSTALLATION

The three options available for data collection are (1) the DC112 Phone Modem, (2) RAD short haul modem, and (3) storage modules. The modems are pre-mounted in the canister. Refer to the specific manuals of each device for technical information on the modem and storage modules.

1.6.1 DC112 PHONE MODEM

Figure 1.6-1 shows the phone modem terminal block located inside the base of the pedestal. A copper shielded, burial phone cable should enter the weather station pedestal via the conduit. Strip 1 7/8" of the insulation off the cable without cutting the copper shield. Strip the copper shield 1 1/2", insert the cable into the ground stud and tighten.

CAUTION: Do not over-tighten the ground lug or damage to the phone line will occur.

Connect the RING signal (orange or blue wires) to the terminal labeled RING and the TIP signal (white/orange or white/blue wires) to the terminal labeled TIP.

1.6.2 RAD MODEMS

Figure 1.6-2 shows the RAD modem terminal block located inside the base of the pedestal. The communication cable is connected between the modem at the computer and the weather station according to the labels shown in Table

1.6. The communications cable connecting the station to the computer must be two twisted pairs (4 conductors) and suitable for burial. Examples are *Anixter part number F-02P22BPN (Rodent Proof) or *Belden part number 1048A.

TABLE 1.6. RAD Modem Connections

SRM-6A at PC	Base of Weather Station
+XMT	+XMT
-XMT	-XMT
+RCV	+RCV
-RCV	-RCV
G	G
*Anixter 4711 601 FRD Skokie, IL 60076 708-677-2600	*Belden P.O. Box 1980 Richmond, IN 47375 1-800-235-3361

1.6.3 STORAGE MODULE SM192/SM716

The CR10 is programmed to automatically transfer data when it detects that a storage module is connected. The storage module is brought to the site and connected to the CR10 as shown in Figure 1.6-3. Data transfer begins within 5 seconds after making connections, and ends a maximum of 55 seconds later. If and SC90 Line Monitor is used, an LED turns on and off when data transfer starts and stops, respectively. Disconnect the storage module and proceed to the office for data playback. **Never leave the storage module connected to the weather station.**

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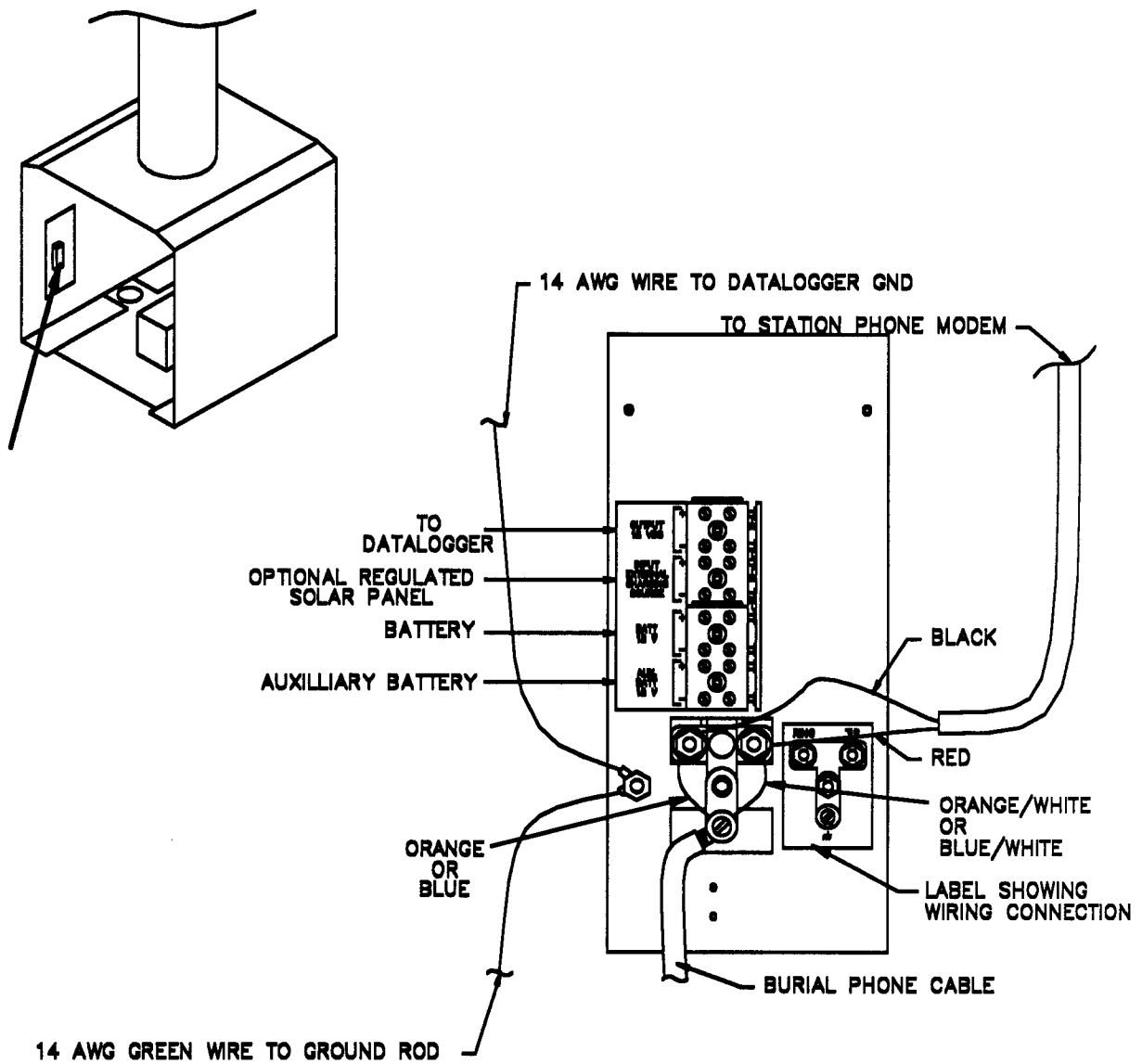


FIGURE 1.6-1. Phone Modem Connections

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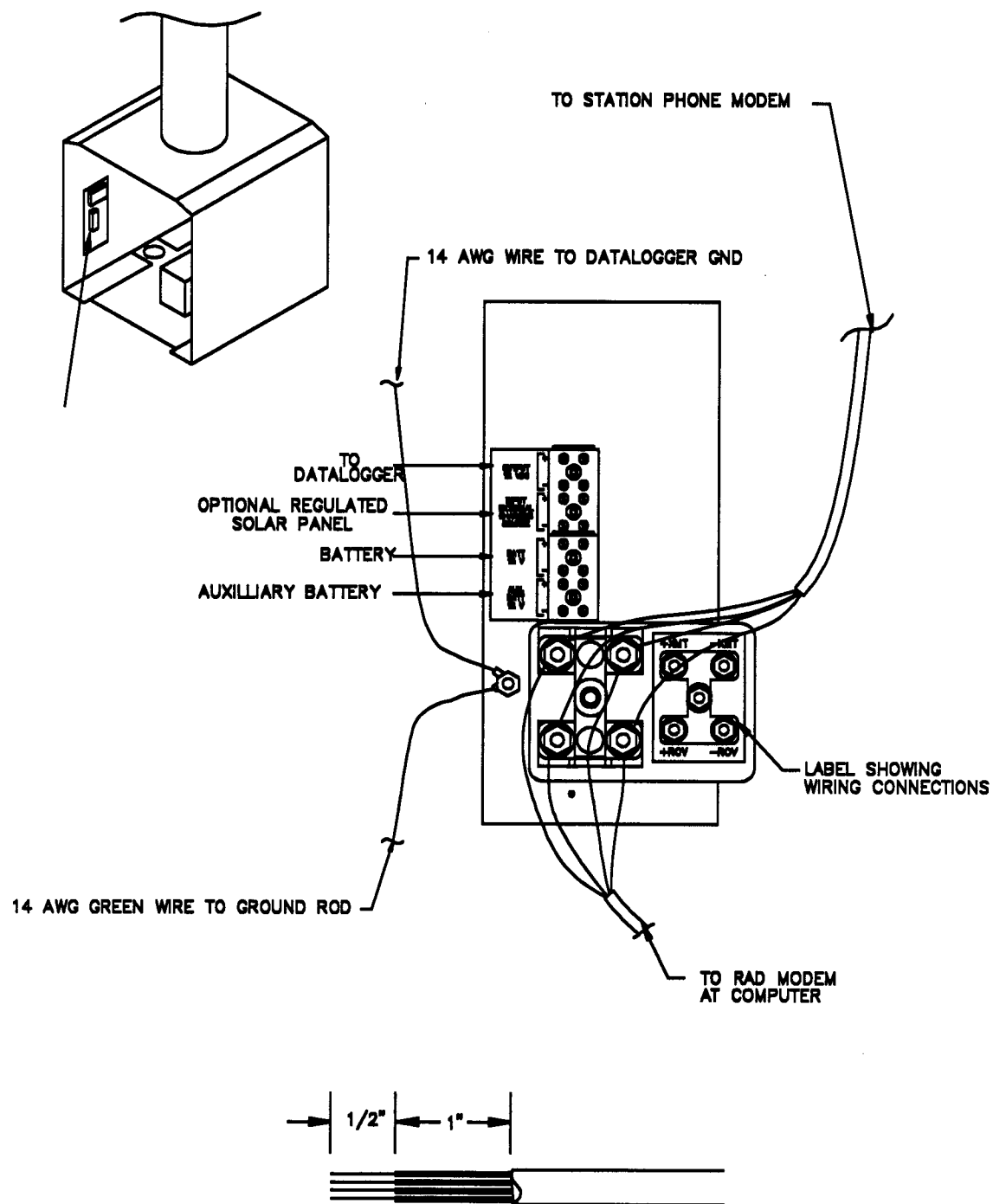


FIGURE 1.6-2. RAD Short Haul Modem

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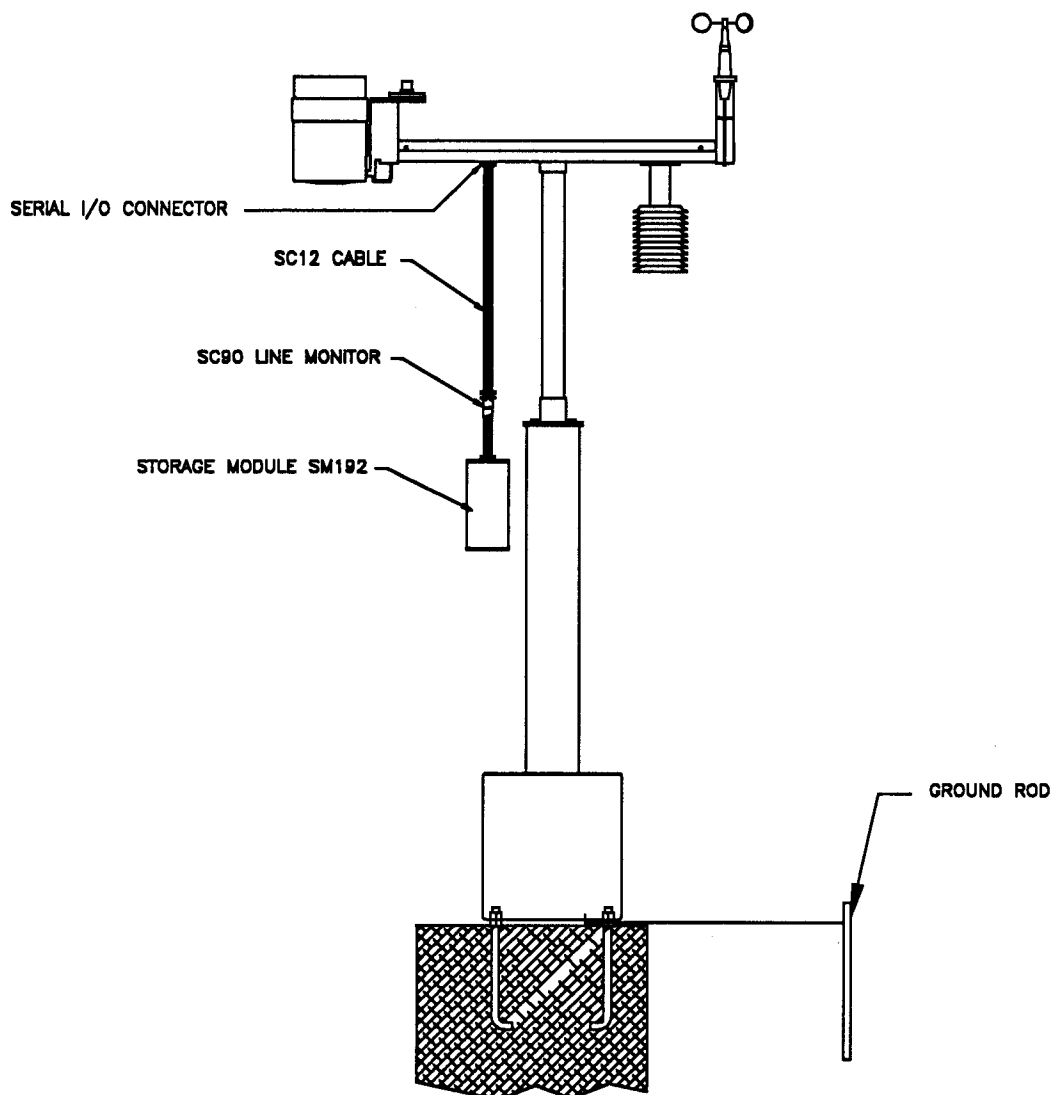


FIGURE 1.6-3. Comax Weather Station with Storage Module

1.7 SENSOR VERIFICATION USING THE CR10KD KEYBOARD DISPLAY

Connect the CR10KD Keyboard Display to the serial I/O connector in the crossarm (refer to Figure 1.6-3) using the Model SC12 cable. Upon connection, the display activates, showing meaningless numbers. Enter *0 and the display

should show LOG1. The sensor measurements are stored in the CR10's Input Locations, accessed through the *6 Mode; refer to the keyboard entry column in Table 1.7-1. If you get lost or make a mistake, start over by entering *6. Once you are in *6, the A key may be used to advance through the locations, and the B key may be used to backup through the locations.

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TABLE 1.7-1. Sensor Verification; Accessing CR10 Input Locations

<u>Description</u>	<u>Units</u>	<u>Input Location</u>	<u>Keyboard Entry</u>
Air Temperature	°F	1	*6A
Solar Radiation ¹	Langley's	2	*62A
Precipitation	inches	3	*63A
Wind Speed	mph	5	*65A
Wind Direction ²	degrees	6	*66A
Canister Moisture*	0-1000	8	*68A
Soil Temperature**	°F	9	*69A
Relative Humidity**	%	11	*611A
Battery Voltage***	Volts	10	*610A

1. Typical values should be between 0 (overcast) and .3585 (bright sunshine).

2. To check the wind vane, point it to the east, wait approximately 10 seconds and compare new reading to 90°; repeat for south (180), west (270), and north (355 to 0).

***WARNING:** Readings above 200 indicate high humidity inside the canister. The canister must be opened and dried, and the desiccant reactivated by heating in an oven at 250° for 16 hours.

****NOTE:** Relative Humidity and Soil Temperature readings are made only if the CR10 User Flags #6 and #7 respectively, are set high. Refer to Section 1.9 for details.

***** NOTE:** Due to reverse polarity protection diodes in the circuit, the battery voltage measurement is approximately .7 volts lower than the actual battery voltage. Minimum operating voltage for the CR10 is 10.5 V.

1.8 SETTING THE CLOCK WITH THE CR10KD KEYBOARD DISPLAY

To set the year, day of year, and time, enter *5 and advance the display to the appropriate window (refer to Table 1.8). Key in the desired value and enter it by pressing the A key. When a new value for hours and minutes is entered, the seconds are set to zero and current time is again displayed. Figure 1.8 shows a day of year calendar.

TABLE 1.8. Sequence of Time Parameters in *5 Mode

<u>Key</u>	<u>Display</u>	<u>Description</u>
*5	:HH:MM:SS	Display current time in hours, minutes, and seconds
A	05:XX	Display/enter year
A	05:XXXX	Display/enter day of year
A	05:HH:MM	Display/enter hours:minutes in military time

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
FEB	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60		
MAR	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
APR	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	
MAY	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151
JUN	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	
JUL	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212
AUG	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243
SEP	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	
OCT	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304
NOV	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	
DEC	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365

During leap year add 1 to day 60 (March 1st) through day 365.

FIGURE 1.8. Day of Year Calendar

An example of entering year 89, day 100, and time 1437 is shown below:

<u>Key</u>	<u>Display</u>	<u>Description</u>
*5	Current CR10 time	If time has not been set, time since power up is shown
A	05:XX	display year
89	05:89	key in correct year
A	05:XXXX	enter correct year and display day of year
100	05:100	key in correct day of year
A	05:HH:MM	enter correct day of year and display hours and minutes
1437	05:14:37	key in correct time
A	:14:37:00	enter correct time and display time

Verify that the year, day and time are entered correctly by entering the *5 mode and advancing to each location:

<u>Key</u>	<u>Display</u>	<u>Description</u>
*5	:14:37:15	display hour, minutes, and seconds
A	05:89	display year
A	05:100	display day of year
A	05:14:37	display hour and minutes
A	:14:37:20	return to the original display of hours, minutes, and seconds

Leave the clock mode (*5) and return to the Log Mode by keying *0.

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1.9 SETTING FLAGS 6, 7 AND 8 TO ENABLE RELATIVE HUMIDITY, SOIL TEMPERATURE AND AVERAGE WIND SPEED AND DIRECTION RESPECTIVELY

The sensor readings of relative humidity, soil temperature and output average of wind speed and wind direction are read only if flags 6, 7, and 8 are set. Below is a table of keys pressed in order to set the desired flags.

TABLE 1.9. Set and Reset Flags 6, 7 and 8

<u>KEY(S) PRESSED</u>	<u>DISPLAY READS</u>	
* 6 A	01:XXXXX	Shows input location 1. To view a location other than 1, the desired location number can be entered preceding the "A" key.
D	00:000000	Shows flags 1-8 are set low.
6,7 or 8	00:000111	Shows flag 6,7 and 8 set high. Press 6 to set flag 6 high, this enables RH readings. Press 7 to set flag 7 high to record soil temperature. Press 8 to set flag 8 high to record average wind Speed and direction.* To return a flag to the low state, simply press the desired key, 6,7 or 8.
A	01:XXXXX	Returns to input location.

NOTE: Relative humidity, soil temperature and 15 minute output average wind speed and direction are not used as part of the GOSSYM model.

*The 15 minute output of wind speed and direction will significantly reduce the amount of days that data can be stored in the weather station from 25 days down to 8 days.

SECTION 2. MAINTENANCE

2.1 MOISTURE IN CANISTER

The hex bolts used to seal the top and bottom of the canister should be tightened every spring and fall to maintain seal integrity. As a guideline, the bolts should be tightened to about 120 inch pounds.

The readings from a moisture detection sensor housed in the canister are displayed in Location 8 and accessed by keying *68A (section 1.7). The sensor detects humidity above 33%. A reading of 0 would indicate dryness, and a reading of 100 would indicate wetness. The readings should be monitored regularly and if they are above 200, the weather station must be dried out.

WARNING: Damage to the CR10, modem, and wiring panel will occur if high moisture levels are not corrected. The weather station should be dried out and the desiccant reactivated when the moisture reading is 200 or greater.

When opening the canister, loosen each hex bolt one half turn until each bolt has been loosened two full turns.

CAUTION: DO NOT REMOVE THE BOLTS FROM THE CANISTER.

Desiccant can be reactivated by placing it in an oven at 250°F for 16 hours.

2.2 RAIN GAGE

Inspect and clean the rain gage as needed to remove leaves, debris, etc. The rain gage calibration is 0.01 in. per tip. The following check is advised every 6 to 12 months.

Rain Gage Calibration:

1. Secure a metal can that will hold at least one quart of water.
2. Punch a very, very small hole in the bottom of the can.

3. Place the can in the top funnel of the rain gage and pour 16 fluid ounces (1 pint) of water into the can (a 16 oz. soft drink bottle filled to within 2.5 inches of the top may be used for a rough field calibration).
4. If it takes less than 45 minutes for this water to run out, the hole in the can is too large.
5. One hundred tips plus or minus three tips should occur.
6. Adjusting screws are located on the bottom adjacent to the large center drain hole. Adjust both screws the same number of turns. Rotation clockwise increases the number of tips per 16 oz. of water; counter clockwise rotation decreases the number of tips per 16 oz. of water. One half turn of both screws causes a 2% to 3% change.
7. Check and re-level the rain gage lid.

2.3 SOLAR RADIATION

Inspect and clean the pyranometer every two to three months. Dusty environments may require more frequent cleaning. **Be careful not to scratch the surface of the sensor.** A blast of clean, dry air, or a soft bristle, camel hair brush is best used for cleaning the diffuser surface. Recalibration of the radiation sensor is recommended every two (2) years.

2.4 WIND SPEED AND DIRECTION

Inspect the operation of the anemometer and windvane bearings at least once a year. They should move freely and react to a wind speed of 2-3 mph. Check the windvane by manually positioning it and verifying the reading.

Components requiring replacement due to normal wear are the precision ball bearings and the azimuth potentiometer. The bearings have a life expectancy of twenty million revolutions (3 to 5 years in normal use). This time may be

SECTION 2. MAINTENANCE

reduced to 1 year or less in high wind areas. The anemometer bearings should be replaced if they become noisy or if the starting threshold increases above an acceptable level.

CAUTION: DO NOT use WD-40 or other lubricants on the bearings.

2.5 TEMPERATURE AND RELATIVE HUMIDITY PROBE

The HMP35C Probe requires minimal maintenance. Monthly, check to make sure the radiation shield is free from debris. The screen on the sensor should also be checked as often. Annually, check the calibration of the probe. (It should be sent to CSI if recalibration is needed and facilities to do so are unavailable.)

2.6 BATTERY VOLTAGE

The battery voltage is recorded daily. The battery should be changed when the voltage is below 10.5 V. Incorrect battery voltage readings occur when the battery is low.

SECTION 3. TROUBLE SHOOTING

The weather station is divided into sensors and the CR10 datalogger for trouble shooting purposes. Appendix B contains sensor specifications and schematics.

3.1 SENSOR TROUBLE SHOOTING

The *6 Mode is used to display current sensor readings (Section 1.7). If an individual sensor reading is incorrect the sensor circuit should be checked with a VOM (Volt/OHM meter). Appendix A provides wiring schematics of each sensor. All sensors, except for the rain gage, have a measurable resistance. Infinite resistance indicates an open circuit.

NOTE: DO NOT connect an ohm meter to the Relative Humidity chip or damage will occur.

Wind Speed

The resistance of the coil measured between pins 1 and 2, should be between 1100 - 1400 ohms.

Infinite resistance indicates the coil is broken; zero resistance indicates a short. Open the sensor and check for moisture or pinched wires.

Wind Direction

The resistance between pins 1 and 2 of the windvane varies from 1 - 11 kohms for a 0-355° direction. A 5° open or "dead" band exists at 355°. The wiper in the potentiometer is most likely damaged if infinite resistance is measured.

The resistance between pins 1 and 3 should always be 10K ohms. Infinite resistance indicates the potentiometer is open and should be replaced.

Rain Gage

The rain gage has a reed switch that closes as the bucket tips. Connect the ohm meter to pins 1 and 2 and tip the bucket **very slowly**. The meter display will flutter momentarily as the switch contacts close then reopen. Lack of contact indicates the reed switch should be replaced.

Solar Radiation

The solar radiation sensor should measure between 60 and 100 ohms when the sensor is dark. Check for an open circuit.

Temperature & Relative Humidity (RH)

NOTE: DO NOT connect an Ohm meter to the temperature and relative humidity probe.

If you are experiencing problems with the temperature and relative humidity probe, consider the following:

1. Are both the temperature AND the relative humidity readings bad? If so, make sure the radiation shield and sensor endcap are free from debris.
2. Is just the temperature reading bad? Again, make sure the radiation shield and sensor endcap are free from debris.
3. Is just the relative humidity reading bad? In this case, the probe needs to be recalibrated. (Contact CSI if facilities to recalibrate are unavailable.)
4. If 1,2 and 3 prove to be ineffective, contact CSI.

3.2 DATALOGGER TROUBLE SHOOTING

The CR10 (1) measures the sensors, (2) converts the measurements to engineering units, (3) processes the values over a time interval, and (4) stores the processed data. If stored data is incorrect, evaluate the current measurements directly using the CR10KD Keyboard Display (Section 1.7).

False battery readings of 9 to 10 volts can be observed in the *6 Mode (*610A, Section 1.5) if the battery voltage falls to 8 volts. If the sensor readings are unreasonable, yet the sensors check out according to Section 3.1, measure the battery voltage independently with a volt meter.

SECTION 3. TROUBLE SHOOTING

The CR10 has a regulated 5 volts which can be measured at the Serial I/O connector (Figure 1.4-1) using the VOM. Figure 3.2 represents the connector. The 5 volts, ± 1 millivolt, is measured between sockets 1 (+5V) and 2 (ground). Insert a bent paper clip or similar object into each socket to provide solid connections to the VOM.

High internal moisture will short connections to the datalogger, resulting in erroneous measurements. Refer to Section 2.1 for action to be taken.

Check Wiring Panel

Measure from 6L to ground (G); it should read 0 volts. If it reads 11 or 12 volts, there is contamination on the wiring panel.

If products need to be returned for repair, contact CSI. After an application engineer determines the nature of the problem, an RMA (Return Materials Authorization) number will be issued.

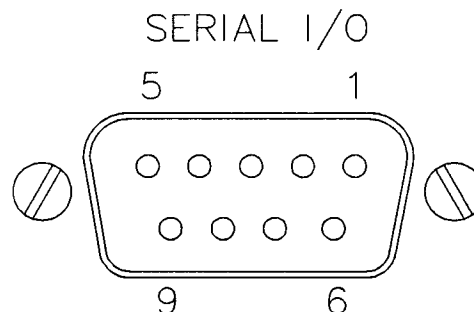


FIGURE 3.2. CR10 Serial I/O Connector

APPENDIX A. SENSOR SPECIFICATIONS AND SCHEMATICS

A.1 SPECIFICATIONS

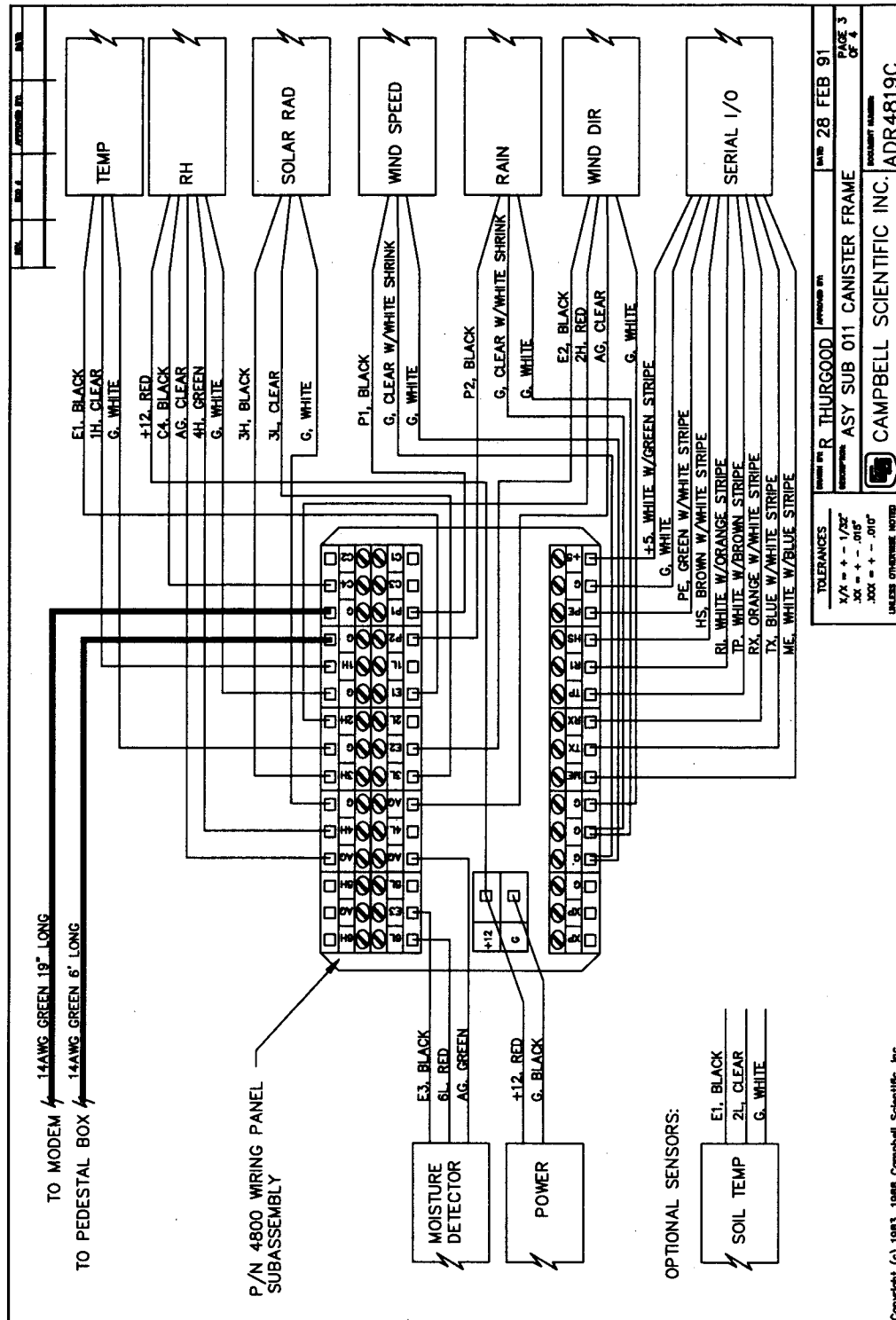
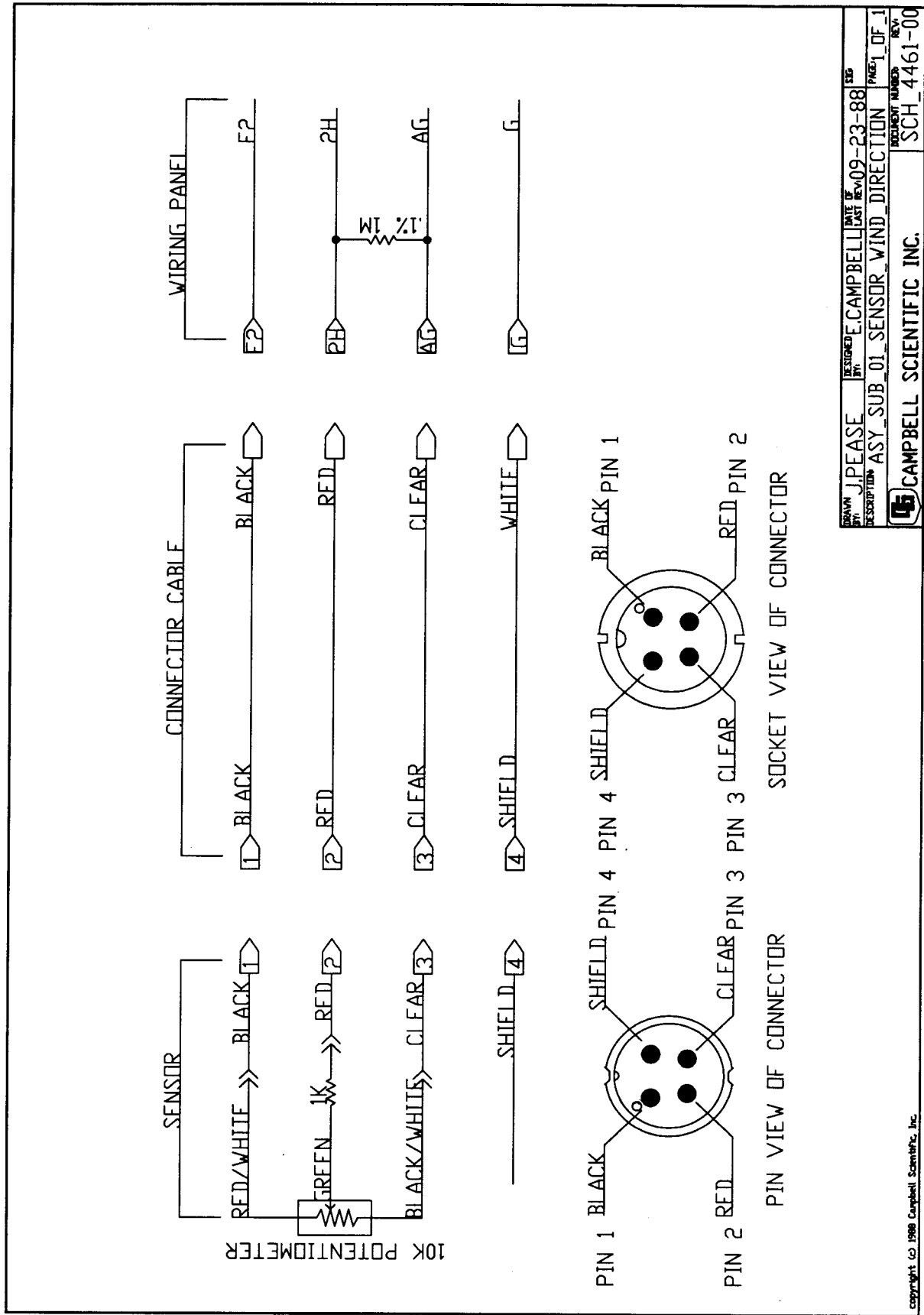
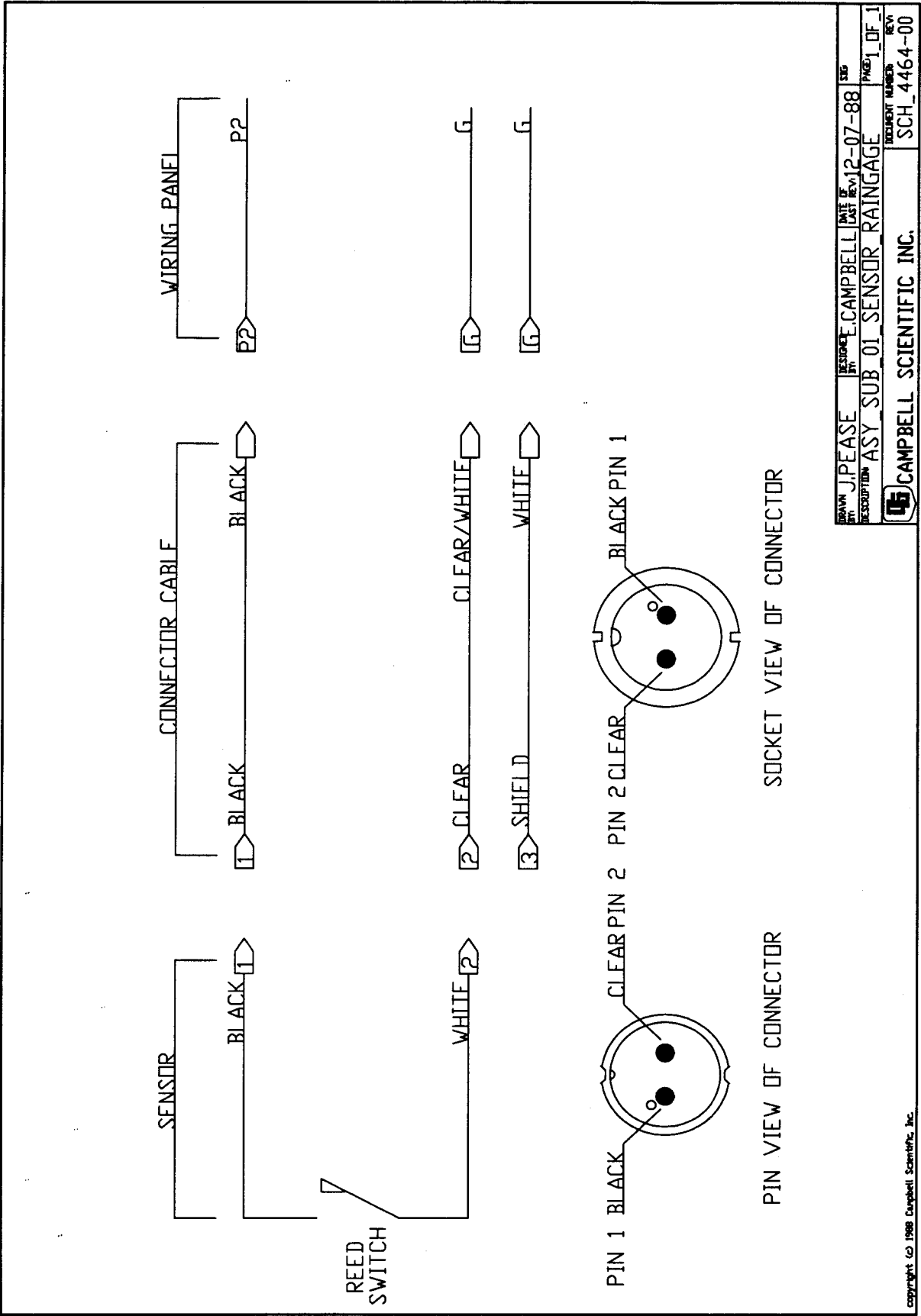


FIGURE A.1. Sensor Channel Assignments and Connections

APPENDIX A. SENSOR SPECIFICATIONS



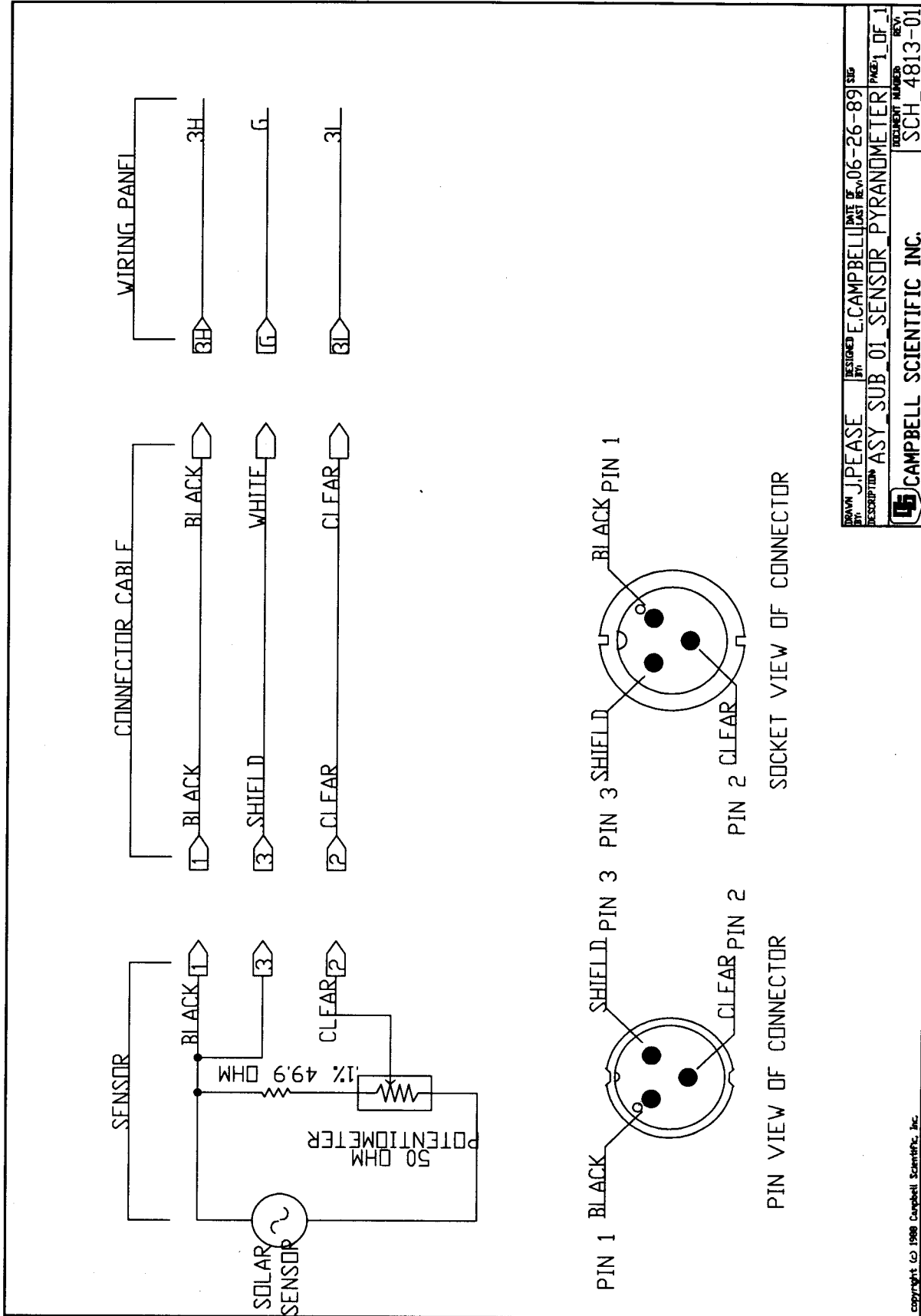
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DESCRIPTION	ASY SUB 01 SENSOR WIND DIRECTION	PAGE 1 OF 1
DOCUMENT NUMBER	SCH 4461-00	REV

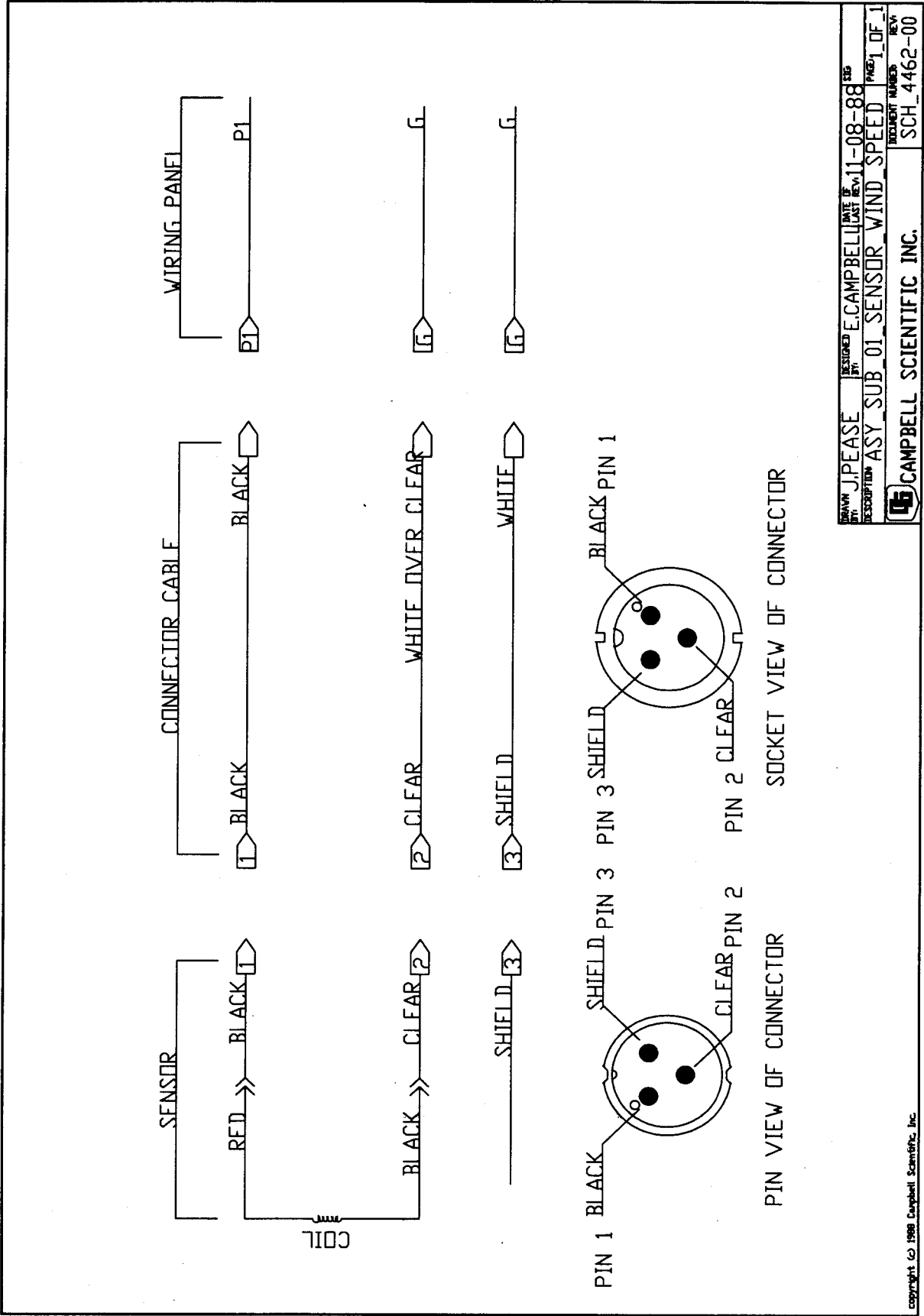


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						REV	

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APPENDIX A. SENSOR SPECIFICATIONS

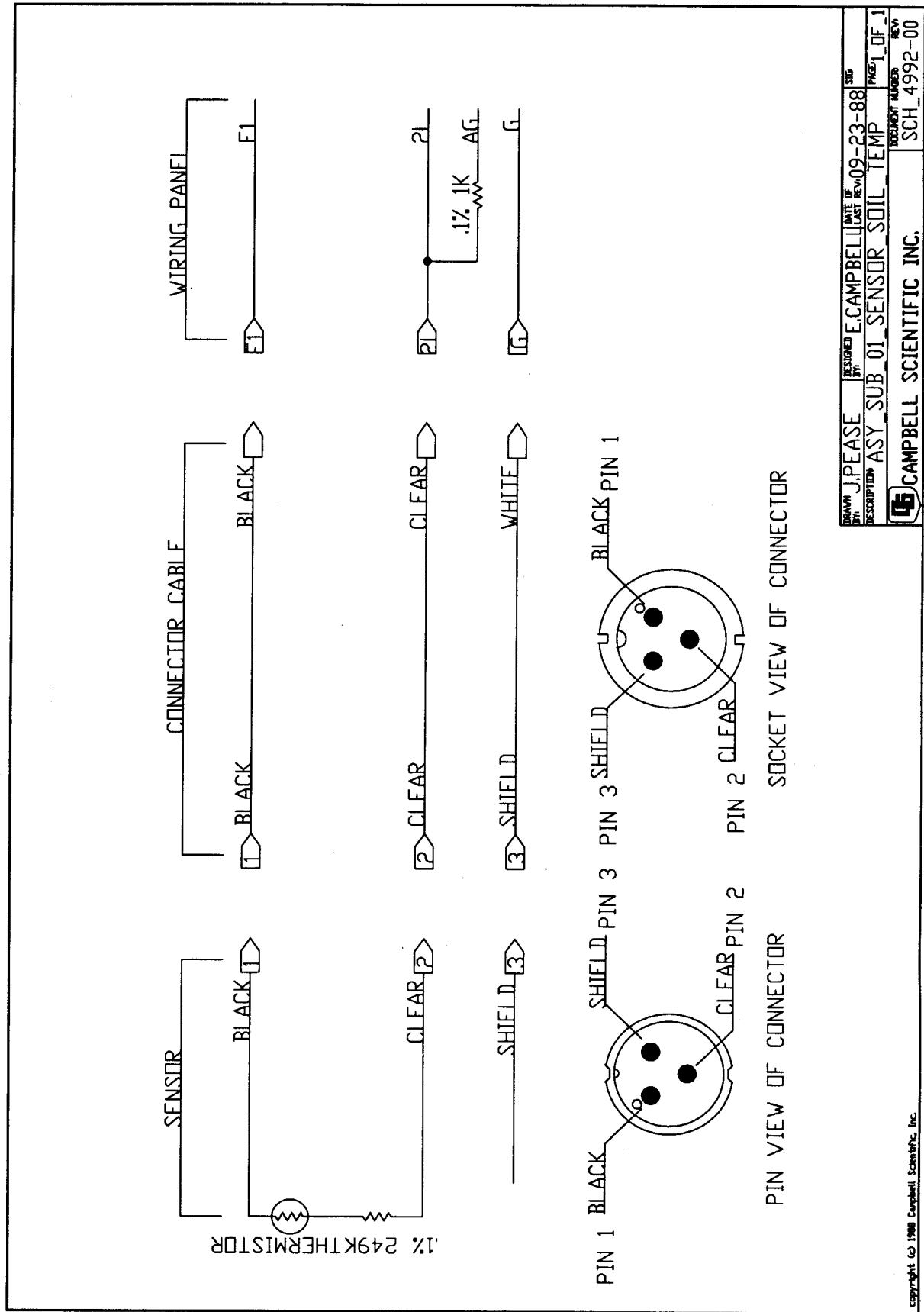




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DOCUMENT NUMBER	SCH_4462-00	REV
CAMPBELL SCIENTIFIC INC.		

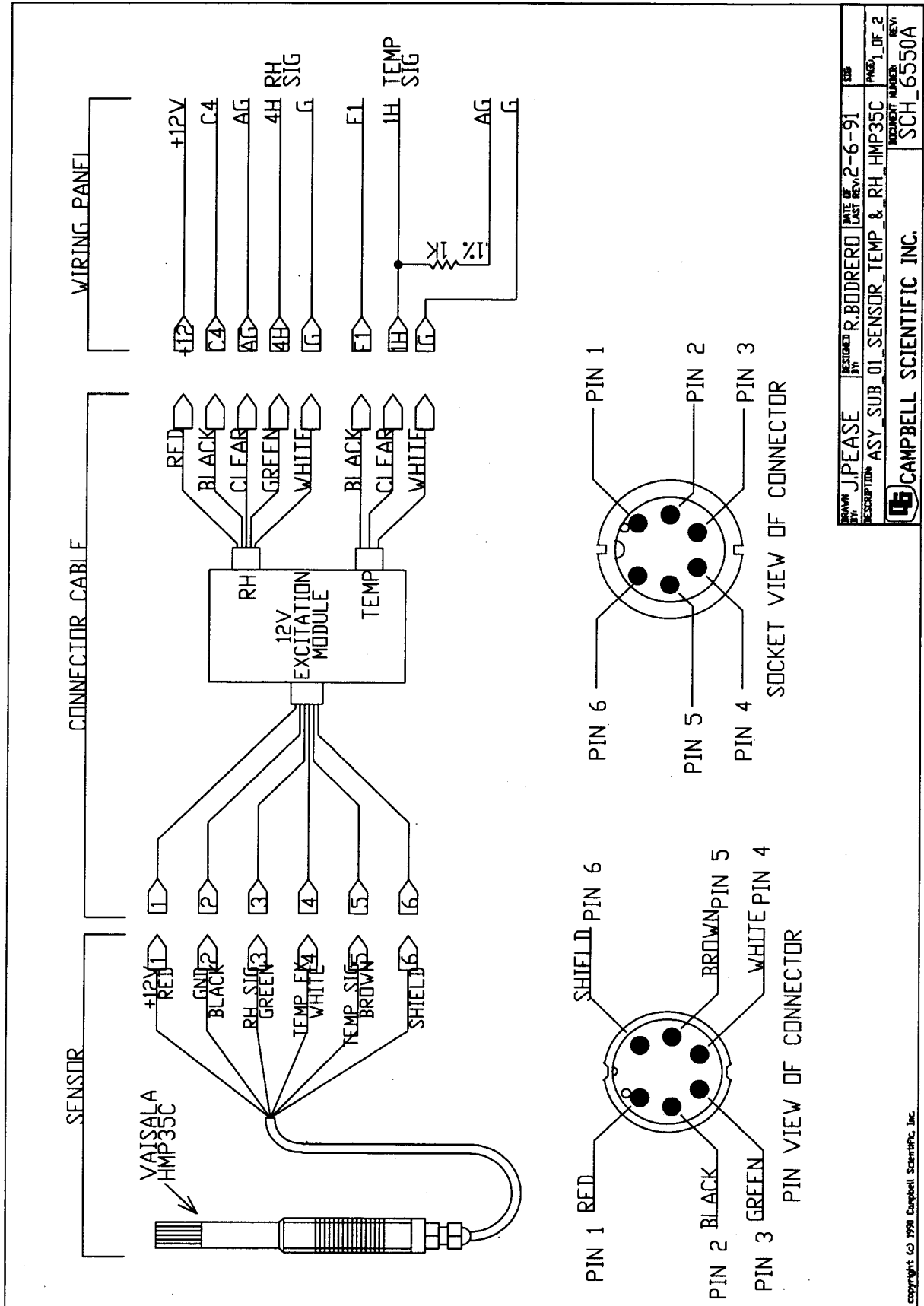
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APPENDIX A. SENSOR SPECIFICATIONS



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DOCUMENT NUMBER	SCH_4992-00	REV
CAMPBELL SCIENTIFIC INC.		



DESIGNED BY	REVISION	DATE	REV
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DESCRIPTION	ASY SUB 01 SENSOR TEMP & RH HMP35C	PAGE 1 OF 2	
		PROJECT NUMBER	REV
		SCH_6550A	

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APPENDIX B. WINTERIZING THE 011 WEATHER STATION

If you are not going to use the 011 Weather Station after the field season, it is in your best interest to winterize it.

Remove the 12 volt battery from the base of the weather station and store in a clean, dry environment.

NOTE: Charge the battery prior to storing it.

Tighten the bolts on top of the canister to prevent moisture from entering. The bolts on the upper seal should be tightened to a torque of 140 inch pounds. To remove the sensors for the winter, loosen the six phillip screws on the cross arm cover. **Do not** remove the screws. Remove the cover to expose the sensor connectors. Disconnect the sensor leads from the sensors. To detach the rain gage and pyranometer from the cross arm, remove the four phillip screws holding the sensors in place. Replace the phillip screws after the sensors have been moved. Follow the same procedure to remove the wind speed and wind direction sensors. Remember to put the screws back into the cross arm.

Remove the sensor from the Gill Radiation Shield, but **do not** remove the shield from the cross arm.

Once the sensors have been disconnected and removed from the cross arm, it is important to protect the sensor leads from the elements. Wrap each connector in Saran Wrap or Handi Wrap to keep moisture off the contacts. Place the connectors in the cross arm, replace the cross arm cover, and tighten the six phillip screws holding the cover.

Remove the sensors from the field. Place the sensors in a plastic bag after they have been cleaned and inspected. Store them in a clean, dry environment. Importantly, remember where you have stored your sensors and battery for the next field season.

In the spring, check and recharge the battery prior to reinstalling. Clean the pyranometer with a soft camel hairbrush or use a gentle clean (oil-free) air blast. Make sure the wind speed and wind direction sensors rotate freely. Check the rain gage to see that it is clean and that the bucket tips. Take the COMAX installation manual to the field and install the sensors.

