

WPS

Weather Processing System

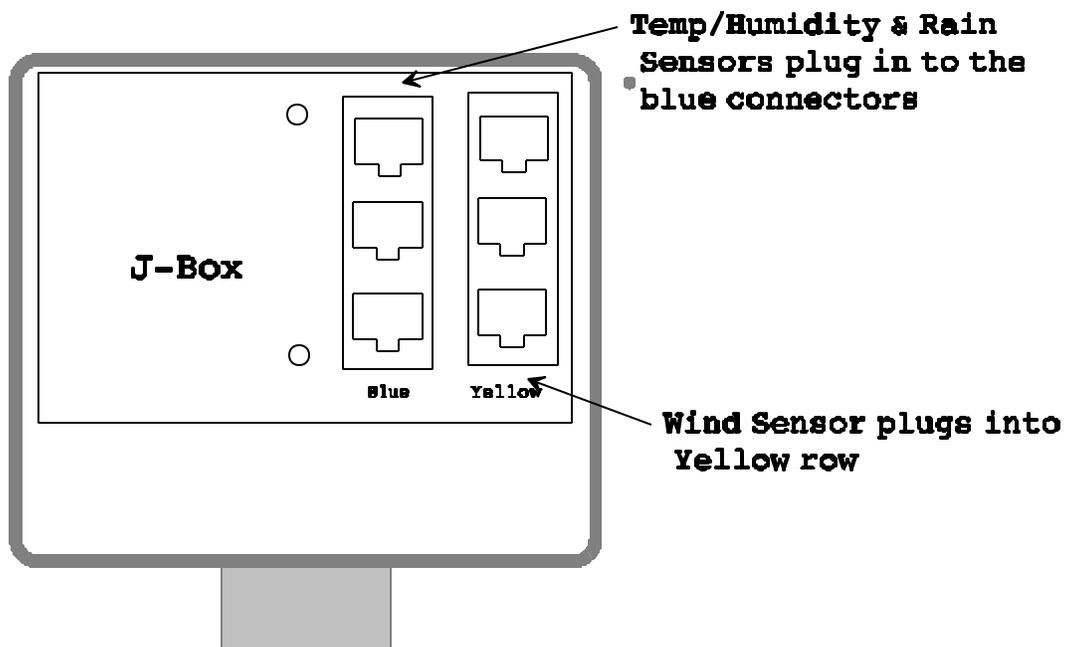
The WPS senses wind, temperature, humidity, barometric pressure, rainfall and time, then outputs this data via a RS-232 interface to other devices. The WPS can be programmed to output current weather, along with minimum and maximum conditions for the day. The WPS keeps track of two different minimum and maximum values and up to 8000 lines of data (depending on memory size) in its non-volatile memory clock. The WPS-10 has 2K of memory and will retain approximately 30 lines of data. The WPS-32 has 32K of memory and will retain approximately 2000 lines of data. The WPS-128 has 128K of memory and retains about 8000 lines of data. All functions of the WPS can be controlled through its RS-232 interface. Located on the front of the WPS console is a red power LED. On the back of the console is a green flashing LED that indicates that the processor is operating normally.

Included with the standard WPS system is a wind direction and speed sensor, a pagoda mounted temperature/humidity sensor, a rain collector and a pressure sensor installed in the display console. Options include solar radiation, lightning and leaf wetness sensors.

Installation

The standard WPS uses three sensors to gather weather data. The wind direction and speed sensor, the temperature and humidity pagoda and the rain collector (*see figure 1*). All are designed to mount to a television type mast (*not provided*). The cables from the sensors go into a junction box, where they connect via RJ45's to two multi-wire cables (intermediates) that are routed into the building and attached to the console. All cables are color-coded. The yellow wind sensor cable plugs into the yellow RJ45 connector in the junction box. The yellow intermediate (wind) also plugs into a yellow RJ45 connector in the junction box. Plug the temperature/humidity pagoda and the rain collector (both colored blue) and the blue intermediate into the blue RJ45 connectors in the junction box. You may place any blue cable into any blue RJ45 connector, the order does not matter.

There is lightning protection (transient voltage suppressers) built into the junction box. It is very important that the mast is grounded or else the transient voltage suppressers will not protect your instrument. The junction box picks up earth ground through the hose clamps mounting the box. We suggest that you install a copper-grounding rod (available at Radio Shack) and run the heavy gauge wire directly behind the hose clamps of the junction box. This arrangement will ground your mast and your junction box.



C A U T I O N !! :BE EXTREMELY CAREFUL NOT TO TOUCH ANY HIGH POWER LINES DURING INSTALLATION OF THE VARIOUS SENSORS!!!

The wind direction and speed sensor is normally mounted on television type antenna masts (see *Figure 1*). For best results the wind sensor should be mounted twenty feet above the roof of the building. Higher installation yields more accurate readings. There is one yellow cable that must be strung from the wind sensor to the console via the junction box. The wind direction sensor is calibrated at the factory and should be installed with the wind sensor arm pointed to the North. The wind sensor can be mounted in any direction and recalibrated via the WPS console, but it is more convenient to use the precalibrated North reference. If calibration is necessary after the unit is already mounted, pick a calm day or immobilize the wind vane by hand and use calibration mode to make these changes. The outside temperature/humidity pagoda should be mounted about two feet under the wind sensor. Again, we suggest a twenty-foot mast for commercial installations to overcome the artificially high readings generated by a hot roof. Plug the temperature/humidity pagoda cable into the blue RJ45 connector in the junction box.

The rain collector is normally mounted on the mast. It should be mounted as low as possible both to reduce windage and to limit movement of the mast, which can cause false readings. The collector should be mounted in a manner that allows rain to enter the collector unencumbered by surrounding obstacles. Use a bubble level to make sure that the collector is perfectly level with the ground. Failure to level the collector will cause inaccurate rainfall readings. The rain collector has one blue cable, which must be connected to the console via the junction box.

Mount the junction box under the rain collector using the hose clamps that are installed on the box (see *figure 1*) and remove the front cover of the junction box. Next insert the connectors from the sensors and the cables from the console through the hole in the bottom of the junction box and then out the front of the box. Plug all the yellow connectors into the

yellow RJ45 connectors and all the blue connectors into the blue RJ-45 connectors and then pull the excess cable out of the junction box (j-box). Be sure and replace the rubber gasket on the junction box so that it can remain watertight.

Plug the yellow intermediate cable (wind) into the yellow pigtail exiting the back of the console. Do the same for the blue cable (temp/humidity & rain). Next, plug in the serial cable into the connector in the rear of the console and the proper serial port of your computer. If you are supplying your own serial cable, be sure that either you have a null modem adapter attached to the cable or that the cable is a null modem cable. **The cable supplied with the WPS will have four connectors or will be marked with a green color on one of the cable connectors.** Plug the wall transformer into a 120V wall socket to power up the unit.

If you have the optional solar sensor, it must be pointed to the South and must be free of shadows created by the other sensors (Near the top of the mast is normally the best). Take care that the sensor is perfectly level. The solar sensor has one red cable. Run the red solar sensor cable to the junction box and plug it in to the red connector in the j-box. Run the red intermediate cable to the console and plug it into the j-box.

Operation via RS-232

The WPS via its RS-232 interface can communicate with computers running either the TWICAL program, standard computer communication programs like Windows Hyperterm or dedicated weather applications like WeatherView32. The WPS responds to the following ASCII characters sent by computers, with ASCII space delimited text.

Command Characters

V- Firmware version number

S- Firmware Serial#

I- Unit ID number

C- Unit responds with a daily minimum and maximum of all parameters, then clears. The rainfall rate is present rather than term rain.

Sample

```
MIN 07/24/90 SW 00MPH 000F 067F 067F 054% 30.00" 00.19"D 01.38"M 00.00"R  
MAX 07/24/90 SSE 25MPH 052F 071F 092F 099% 30.06" 00.19"D 01.38"M 00.72"R
```

c- Unit responds with a daily minimum and maximum of all parameters, then clears. The term rain is present rather than rainfall rate. (*Note: use of the either c command will clear the logged min/max.*)

Sample

```
MIN 07/24/90 SW 00MPH 000F 067F 067F 054% 30.00" 00.19"D 01.38"M 00.00"T  
MAX 07/24/90 SSE 25MPH 052F 071F 092F 099% 30.06" 00.19"D 01.38"M 00.72"T
```

The minimum and maximum associated with the C command is cleared automatically at midnight

- D- Unit responds in an identical manner as the C command but does not clear the system memory.
- d- Unit responds in an identical manner as the c command but does not clear the system memory
- E or e- Unit responds with minimum and maximums along with date and time of occurrence. This uses the same buffer as the c and d command.
- M- Unit responds with all term minimums and maximums with the date and time of their occurrence, then clears.
- m- Unit responds in an identical manner as with the M command but does not clear the system memory.

Sample
 TA 10:33 038F TA 09:32 056 F
 TI 04:15 075F TI 15:03 080 F
 TO 10:33 038F TO 16:10 056 F
 RH 15:44 033% RH 01:40 060 %
 BP 16:11 29.57" BP 10:20 30.15"
 RD 04/29 00:00" RT 01:00"
 RM 03.32" WS 00:00 000 MPH 048

The system has two completely separate memory buffers (C and M commands). C is cleared every midnight. M is only cleared by pressing the clear and min buttons on the display or sending an upper case M via a computer.

- R- Unit responds with current conditions. The rainfall rate is present rather than the term rain. (Note: in 30.04R the "R" denotes rising pressure)

Sample
 5:15 07/24/90 SSE 04MPH 052F 069F 078F 099% 30.04R 00.19"D 01.38"M 11.78"T

- r- Unit responds with current conditions. The term rain is present rather than the rainfall rate. (Note: in 30.04F the "F" denotes falling pressure, a "S" character denotes steady pressure.)

Sample
 5:15 07/24/90 SSE 04MPH 052F 069F 078F 099% 30.04F 00.19"D 01.38"M 00.72"R

- K- Unit responds with current calculated values for dew point, Windchill and heat index.
- Q- Unit response with hi resolution time, wind, temperature and pressure (in hi-res models only).

Sample
 96/01/15 09:21:44 SSE 004.3MPH 052.6F 069.2F 078.5F 069% 30.041F 002.19"

The following commands respond if the WPS has logged data in memory.

- T- Data logger top, moves pointer to the top of the data records, then sends data
- N- Data logger next, moves pointer to the next data record, then sends data.
- A- Data logger again, sends same data again.
- P- Data logger previous, moves pointer to the previous data record, then sends data.
- B- Data logger bottom, moves pointer to the bottom of the data records.

Sample

96/03/07 23:00 056.2F 053.2F 085.8F 070% 29.9261" 00.00"ID 007.5MPH 342D

date time temp humidity bp rain wind speed direction

Note: if you have the optional solar sensor, all aux temperature data will be replaced with solar data followed by the letter K.

Reference

Control Options

The WPS has several control options can be changed via the TWICAL software, which is available on www.txwx.com. The control option includes daylight savings mode. Which when enabled will make the weather station automatically change the weather station time in keeping with daylight savings time as recognize in the United States. The wind speed scale option determines if the wind speed scale registers in MPH or knots when in English mode. When the unit is in metric mode the wind speed is always in kilometers per format. Instant wind speed output is the fifth option. When turned on the windspeed output to the RS-232 port is an instant reading rather than a one-minute average.

RS-232 Interface

The pin out on the RS-232 interface is as follows:

<u>DE 9 Plug</u>	<u>Header</u>	
Pin 1	Pin 1 . . .	
Pin 2	Pin 3 . . .	Receive Data
Pin 3	Pin 5 . . .	Transmit Data
Pin 4	Pin 7	Data Set Ready
Pin 5	Pin 9 . . .	Signal Ground
Pin 6	Pin 2 . . .	Data Terminal Ready (must be true to send data)
Pin 7	Pin 4 . . .	Clear to Send
Pin 8	Pin 6 . . .	Request Send
Pin 9	Pin 8 . . .	

To communicate with a computer a null modem adapter or cable must be used. memory are available from Texas Weather Instruments.)

Typical Output

Time	Date	Direction	Speed	Temperature			Humidity	Pressure	Daily	Monthly	Rainfall
				Aux	Indoor	Outdoor			Rain	Rain	Rate
15:00	07/24/90	127	03MPH	070F	069F	082F	090%	30.04"	00.01"D	01.20"M	00.00"R
15:15	07/24/90	130	04MPH	052F	069F	078F	099%	30.04"	00.19"D	01.38"M	00.72"R
15:30	07/24/90	122	02MPH	065F	068F	072F	089%	30.04"	00.19"D	01.38"M	00.00"R
MIN	07/24/90	123	00MPH	070F	067F	067F	054%	30.00"	00.19"D	01.38"M	00.00"R
MAX	07/24/90	135	25MPH	052F	071F	092F	099%	30.06"	00.19"D	01.38"M	00.72"R

Computer Interface

The WPS with the proper cable, may be plugged directly into computers equipped with RS-232 interfaces. Data may be captured using a communication program like

hyperterminal or the TWICAL program. The WPS sends data in a serial format at 300 to 19.2 baud rate, 8 data bits, no parity and one stop bit.

Note: The WPS has two separate minimum and maximum memories. Clearing the M command minimum and maximum memory will not affect the C command minimum and maximum memory and vice-versa. The printer/computer memories clear at 12:00 midnight every day and/or when the c key is pressed on the computer console.

Calibration

The Weather Report comes pre-calibrated from the factory, but it is possible to recalibrate most of the primary functions of the instrument using TWICAL program.

Barometric Pressure

Normally, barometric pressure is the only item that needs to be recalibrated (adjusting for altitude). The proper local barometric pressure can be obtained from the local news. Set the barometric pressure reading you obtained from the local media by using the calibration mode function.

Temperature

If for some reason you suspect that the temperature is not calibrated properly, use a quality bulb thermometer with which to calibrate the temperature. Remember that the WPS will be most accurate near the temperature at which it was calibrated.

Humidity Sensor Calibration

The humidity sensor is calibrated by inputting two voltages found on the humidity sensor into the WPS. Humidity calibration factors can be entered using the software program TWICAL. The humidity calibration numbers are found on the humidity/temperature sensor and on the bottom of the WPS instrument console. These calibration numbers are supplied to us by the manufacturer of the sensor and are normally not changed.

Rainfall

The WPS is compatible with most rain collectors on the market today. Actual measurement calibration is accomplished inside the rain collector by adjusting two stainless steel screws.

Setting 0 turns the rainfall counter off. Setting 1 or 2 tells the WPS to react with one count for every momentary switch closure of the rain collector.

Setting 3 tells the WPS to react with one count for every rain collector switch transition from an open or closed state.

The rain measurement value tells the WPS how much rainfall to display for each count.

THE PROPER SETTING FOR THE TEXAS WEATHER INSTRUMENTS RAIN COLLECTOR IS "2" FOR THE COUNT AND ".01" FOR THE MEASUREMENT.

The daily rainfall register is zeroed every day at midnight. The monthly rainfall register is zeroed on the last day of each month at midnight. The term rainfall register is never zeroed automatically, it must be manually zeroed through the calibration routine.

Report Flag

The report flag selects the format of the RS-232 output and may be changed via the the print set mode or the TWICAL program calibration

<u>SETTING</u>	<u>MIN/MAX</u>	<u>FORM FEED</u>	<u>RAIN RATE</u>
0	OFF	OFF	OFF
1	ON	OFF	OFF
2	OFF	OFF	OFF
3	ON	ON	OFF
4	OFF	OFF	ON
5	ON	OFF	ON
6	OFF	OFF	ON
7	ON	ON	ON

When rain rate is off, term rain is substituted.

Min/Max, when selected outputs at midnight the minimum and maximum value for the day. The report function must be on in order for the output to occur. This function must also be on if you want the minimum and maximum to be logged to memory.

Form Feed, when selected, sends a form-feed character at midnight, which is normally desirable if a printer is directly hook up to the RS-232 interface.

Rainfall rate, when selected, outputs rainfall rate instead of term rain in the report function.

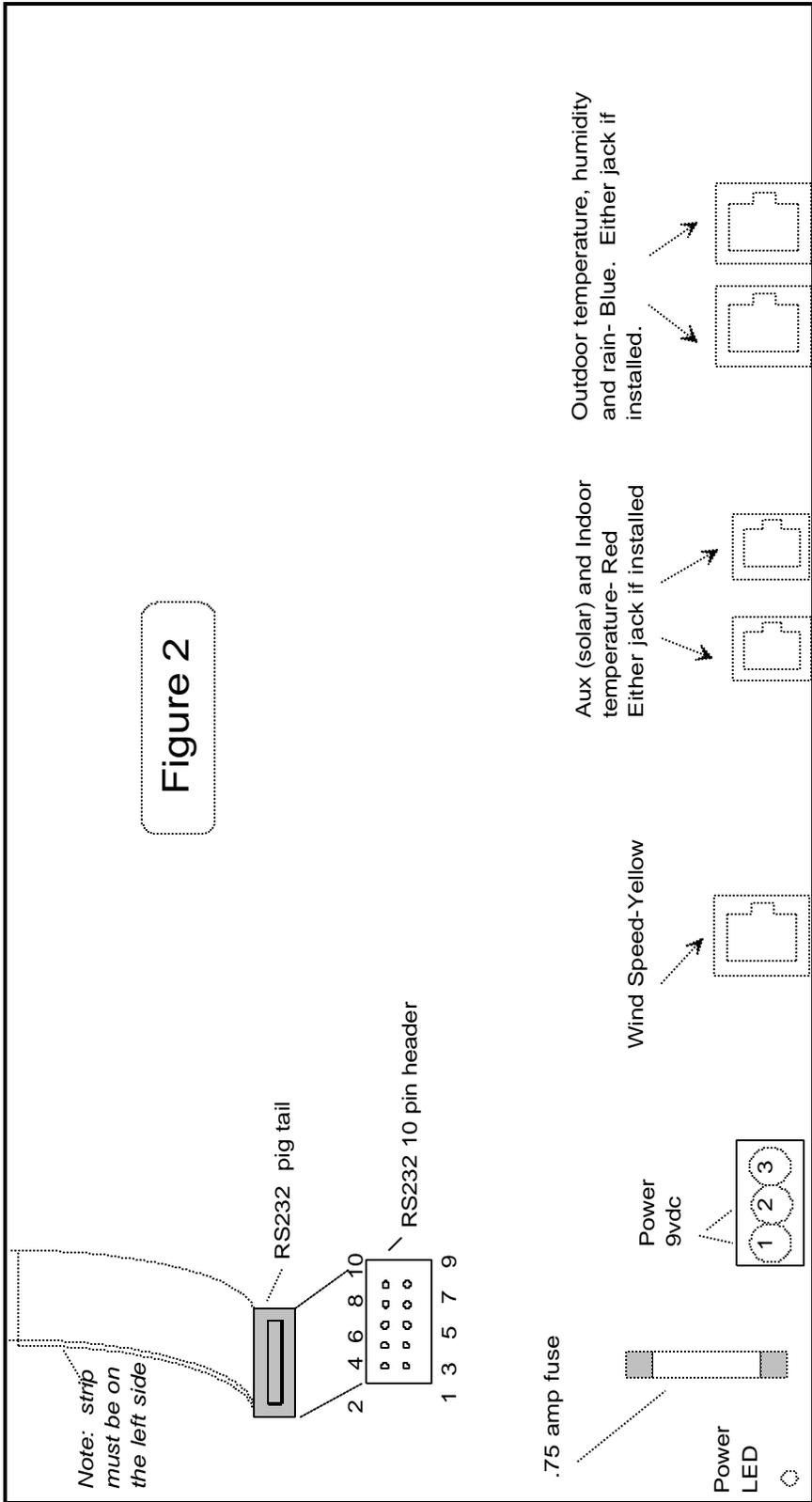


Figure 2

FCC RADIO FREQUENCY INTERFERENCE STATEMENT

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15, Subpart B, of the FCC Rules. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, this equipment may cause interference to radio communications.

The limits are designed to provide reasonable protection against such interference in a residential situation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna of the affected radio or television*
- *Increase the separation between the equipment and the affected receiver.*
- *Connect the equipment and the affected receiver to power outlets on separate circuits.*
- *Consult the dealer or an experienced radio/TV technician for help.*

MODIFICATIONS

Changes or modifications not expressly approved by *Texas Weather Instruments, Inc.* could void the user's authority to operate the equipment.

SHIELDED CABLE

Shielded RS-232 cables must be used with this equipment to maintain compliance with FCC regulations.

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