



TEXAS WEATHER INSTRUMENTS INC.

Manufacturer of Digital Weather Stations

5942 Abrams Road #113 Dallas, TX 75231(214) 368-7116 or (800) 284-0245

Weather Report Logger™

Digital Weather Station

WRL-25, WRL-32 & WRL-128

Thank you for purchasing a Weather Report. Your package should contain a WRL console, wind sensor, temperature/humidity sensor, rain collector serial cable and a diskette that contains the TWI_LOG software. The WRL is unique because it can be programmed and queried by both the buttons on the display and by PC via the RS-232 serial port. Also data can be saved internally or by an external device via its RS-232 port. By accessing the logging mode (press **select** and **time** hold) the user can access previously logged data, up to 8000 lines in the WRL-128 Version, 2000 lines of data in the WRL-32 or 30 lines of data in the WRL-25.

Normal Operation

When in normal operation (no buttons depressed). the instrument displays current wind direction and speed, cycles current time and date, cycles current indoor, outdoor and if selected, aux temperatures (if both the indoor and outdoor indicator lights are extinguished, Aux. temperature is displayed) cycles current barometric pressure, current relative humidity, and cycles daily, monthly and term cumulative rainfall. By utilizing the hold buttons associated with each display, the user may select the most important readings to the user. When wind speed in excess of 99 miles per hour are experienced a small light will turn on between the digits of the wind speed display.

Trend indicators (arrows) are located to the right of the temperature, relative humidity, and barometric pressure displays. If, for example, the current relative humidity was increasing the up trend arrow would be lit. If there was no change, no arrow would be lit.

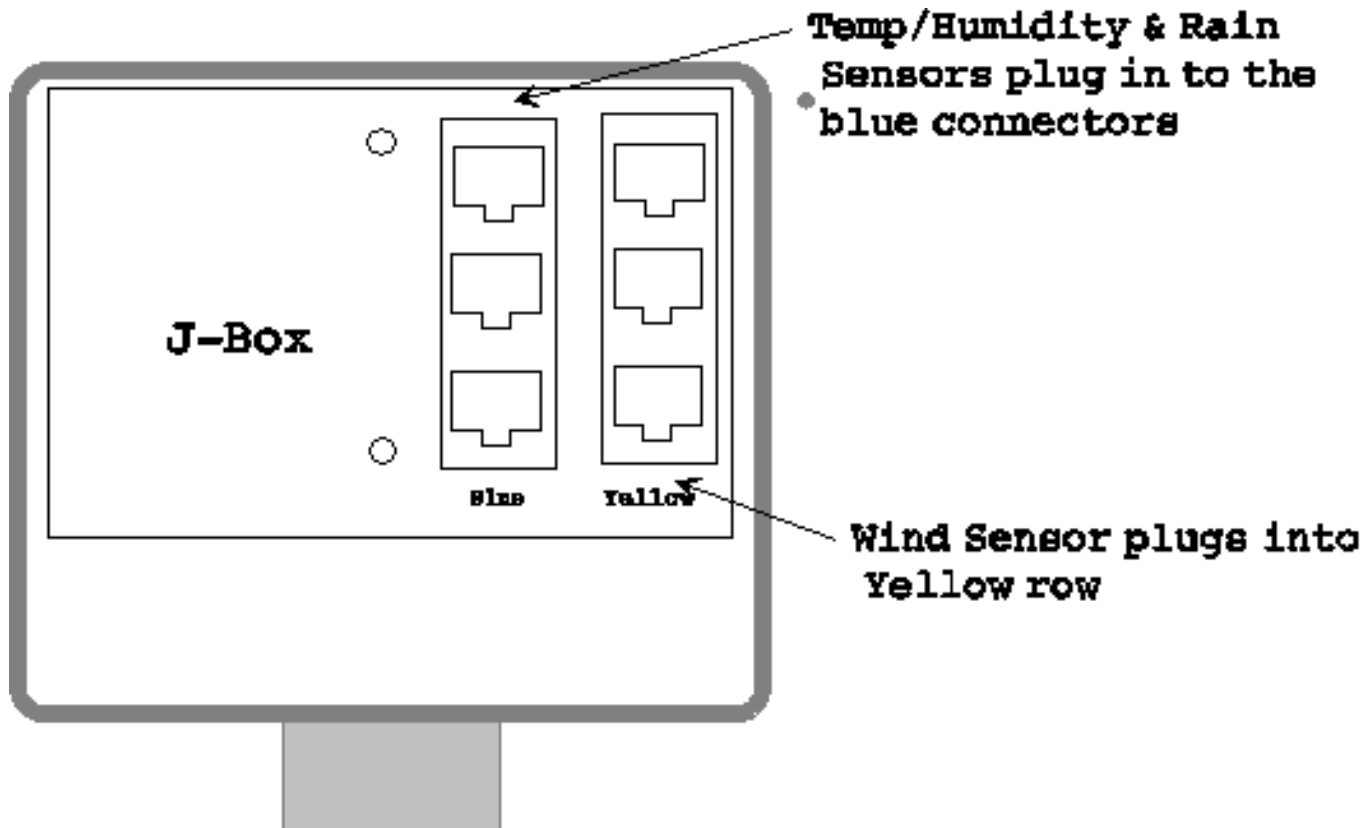
INSTALLATION

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We strongly suggest that all the weather station cables and sensors be connected to the weather station and tested prior to installation so that you may become familiar with the operation of the instrument.

The WRL 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 in to any blue RJ45 connector, the order does not matter.



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

There is lightning protection (transient voltage suppressers) built into the junction box. It is very important that the mast be grounded or 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.

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 at twenty feet above the roof of the building. The higher the installation, the more accurate the 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 wind sensor arm pointed to the North. The wind sensor can be mounted and calibrated via the WRL console in any direction at a later time, but it is more convenient to use the precalibrated North reference. If calibration is necessary after

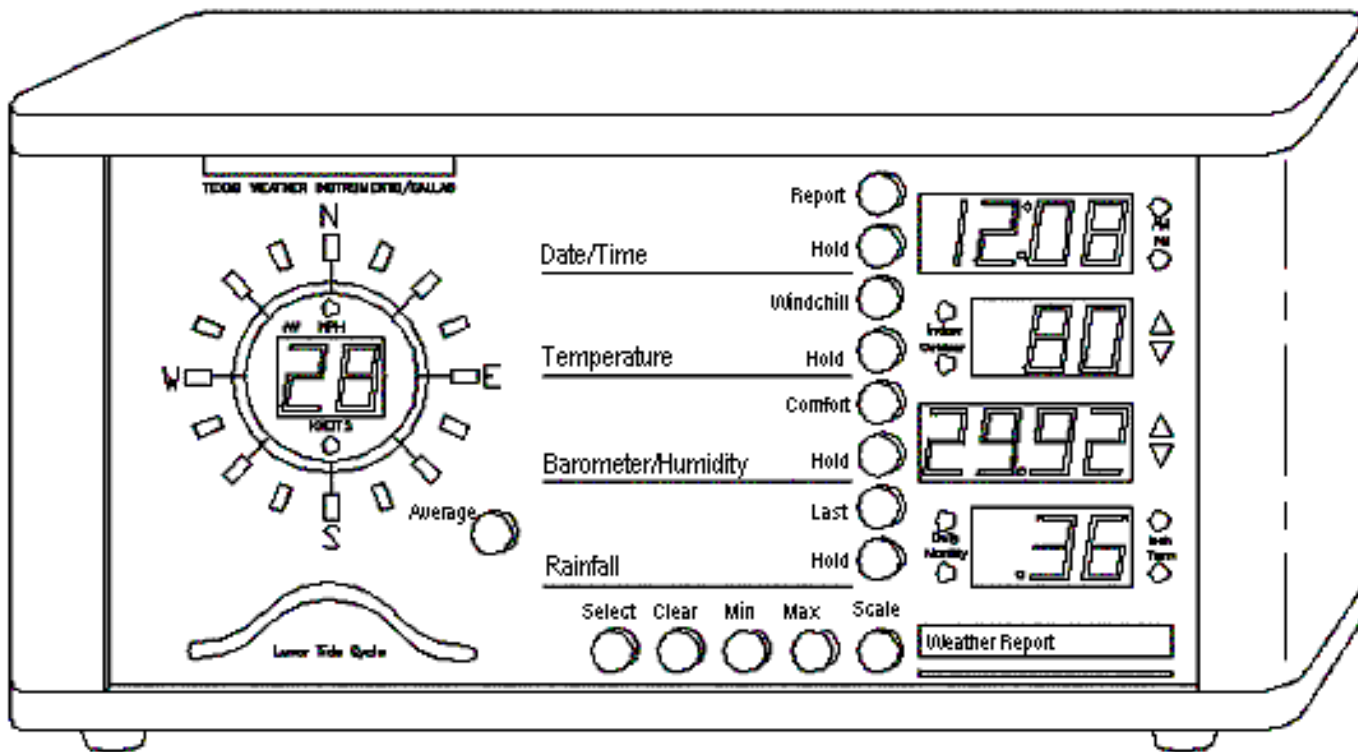
the unit is already mounted, pick a calm day or immobilize the wind vane by hand. Enter calibration mode on the display ([see page 9](#)) and step the direction around using the min or max key, or load the **TWI_LOG** program ([see page 14](#)) in your computer and change item 7, *wind dir offset*, until the proper direction achieved.

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 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](#)). Remove the front cover of the junction box, inserting the connectors from the sensors and the cables from the console through the hole in the bottom of the junction box and then out of the front of the box. Plug all the yellow connectors in the yellow RJ45 connectors and all the blue connectors into the blue RJ-45 connectors and then pull the excess cable out of the j-box. Carefully seal the bottom hole in the box from the inside by using the plumbers putty provided. 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). cables. Next plug in the serial cable into the connectors 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 you have a **null modem adapter** attached to the cable or that the cable is a null modem cable. **The cable with four ends that is supplied with your instrument has a null modem built in.** Plug the wall transformer into a 120V wall socket to power up the unit.



OPERATION

FUNCTION KEYS

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Select The **select** key, when pressed at the same time as the **report** key, puts the unit into time/date and **lunar/tide cycle** set mode. When the **select** and **scale** keys are pressed at the same time, the unit enters the calibration set mode. When the **select** and **average** keys are pressed at the same time, the unit enters the printer set mode. When **select** and **last** are pressed at the same time the instrument enters rainfall history set. When **select** and **time hold** are pressed at the same time the instrument enters logging mode. Once the instrument is in its respective mode, the **select** key is used to step through the different functions.

Clear The **clear** key, when depressed, causes the unit to display the date and time of the last memory clear. Pressing **clear** and **minimum** at the same time clears the unit's memory. Pressing **clear** and **maximum** at the same time also clears the unit's memory. Pressing **clear** and **last rain** clears the term rainfall.

Minimum The **minimum** key, when repeatedly depressed, steps through wind-speed/wind-direction, temperature, barometric pressure, humidity and rainfall rate, displaying the minimum reading of each of these functions since the last time the unit memory was cleared. In addition to the minimum reading, the unit displays the date and time of its occurrence. The date and time display must not be on hold in order to display both date and time.

Maximum The **maximum** key functions the same as the **minimum** key, but with maximum

readings.

Scale The **scale** key changes the displays from reading in English values to those of Metric values. The inch light near the rain display is on when the instrument is in English mode. The English to Metric equivalents are miles per hour or Knots to Kilometers per hour, Fahrenheit to Celsius, Inches of Mercury to Millibars, Inches of rain to Centimeters of rain. Pressing the **select** and **scale** key at the same time puts the unit into calibration mode.

Report Pressing the **report** key sends current data to the serial port. The **report** key, when depressed at the same time as the **select** key, puts the unit into its time setting function. Pressing the **report** key while in logging mode will send all data in memory from the currently displayed record forward to the RS-232 port.

Hold The **hold** key when depressed (toggled on) stops the cycling between two different parameters on the same display.

Windchill The **Windchill** key, when depressed, calculates and displays, using wind speed and temperature, a factor which represents how cold the temperature and wind feel to bare flesh. Pressing the **windchill** and the **comfort** key at the same time will display the dew point.

Comfort The **comfort** key, when depressed, calculates and displays, using humidity and temperature, a factor which represents how warm the temperature feels.

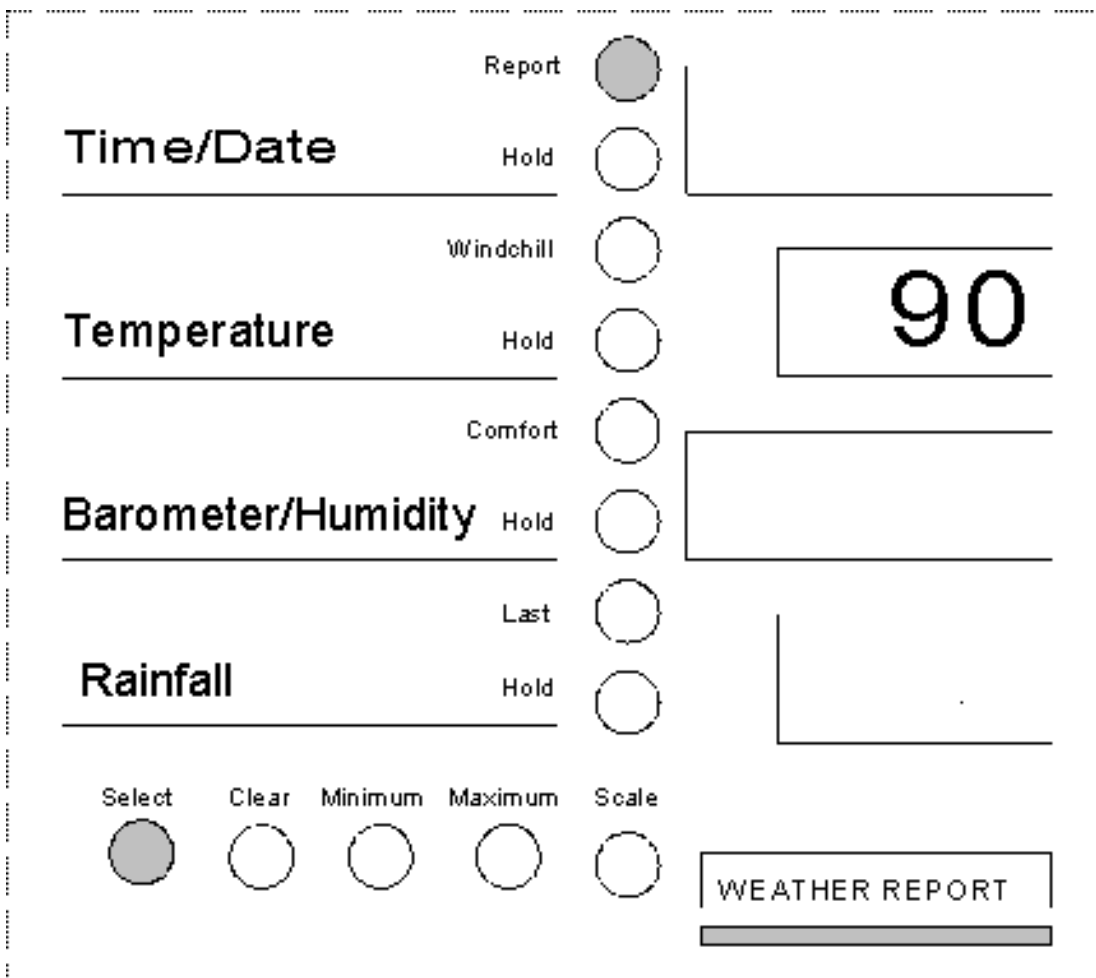
Last The **last** key, when pressed, displays the time and date of the last rainfall and its rainfall rate. When pressed at the same time as the clear key, the instrument clears the term rainfall register. When **last** pressed at the same time as **select**, the unit enters into rainfall history mode.

Average When toggled on, the dot below the Av light (near the wind speed display), indicating that the unit is in wind averaging mode. When in wind averaging mode, the instrument displays the previous minute's average wind direction and speed. When pressing the **average** key and the **select** key at the same time, the unit enters into the printer set mode.

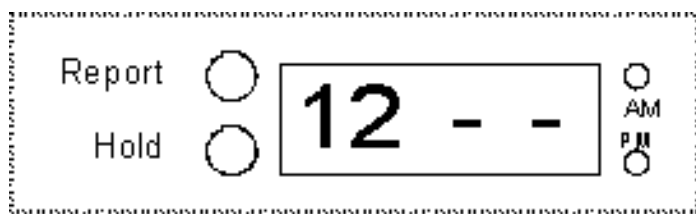
Time Setting Mode:

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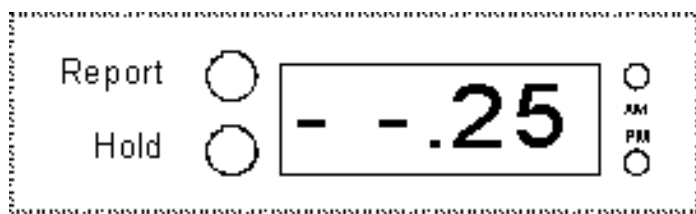
Press **select** and **report** at the same time, and the last two digits of the year displays (i.e., 90 = 1990). Press the **maximum** button to advance the year; the **minimum** button to retard the year.



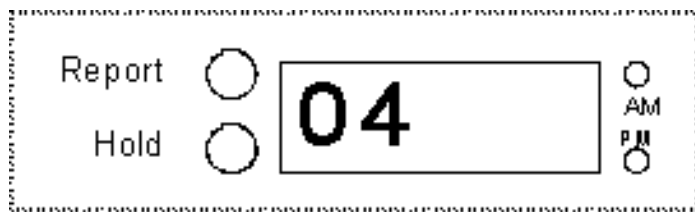
Press **select** a second time, and the month will be displayed (i.e., 1 = Jan. and 12 = Dec.). Press the **maximum** and **minimum** key to set the month.



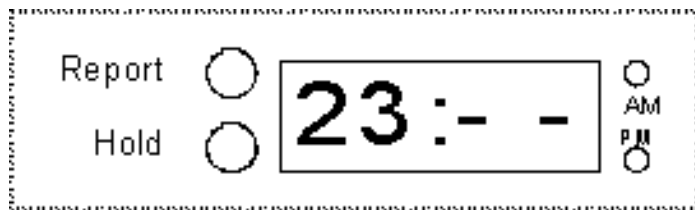
Press **select** a third time, and the day of the month (1-31) digits light. Press the **maximum** to advance the date and **minimum** to retard the date.



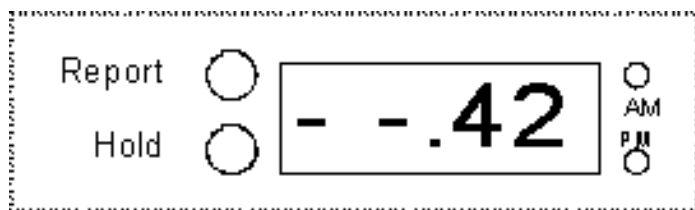
Press **select** a fourth time, and the day of the week is displayed (1 = Sunday, 2 = Monday, 3 = Tuesday, 4 = Wednesday, 5 = Thursday, 6 = Friday, and 7 = Saturday). Press the **maximum** button to advance the day of the week and **minimum** to retard.



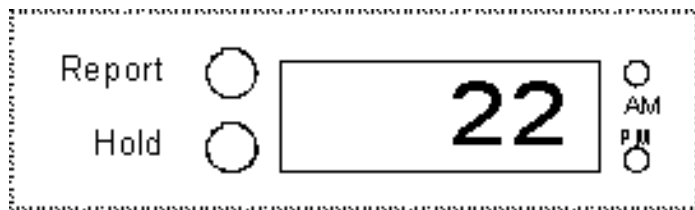
Press **select** a fifth time (note the colon between the hours and minutes), and the unit will display the time in military hour style. Press the **maximum** button to advance the hour or **minimum** to retard the hour.



Press **select** a sixth time (note the colon between the hours and minutes), and the unit will display minutes. Press the **maximum** or **minimum** buttons.

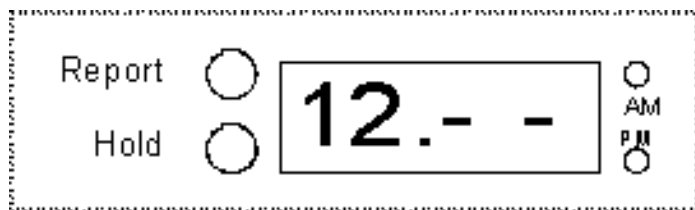


Press **select** a seventh time (note only the right two digits); the unit will display seconds. Press the **maximum** or **minimum** buttons to set the seconds. (note: the seconds is updated on the display only when the maximum or minimum button is being depressed).

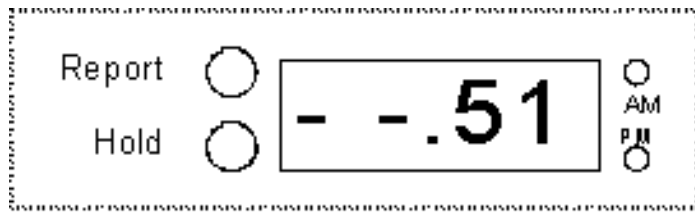


Press **select** a eighth time (a single dot at the bottom separates the hour and minute); the lunar/tide clock will display the number of hours in a cycle.

Press the **maximum** or **minimum** buttons to set the hours of the cycle (explained in the Lunar Tide section).



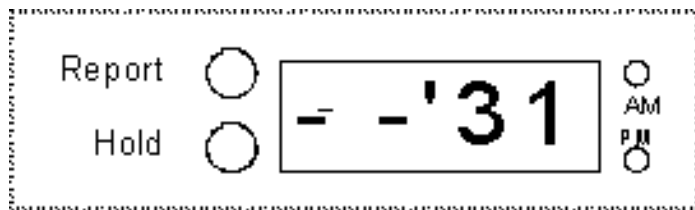
Press **select** an ninth time (the single dot remains at the bottom, separating the hour and minute); the lunar/tide clock will display the minutes of the cycle. Press the **maximum** or **minimum** buttons to set the minutes of the cycle.



Press **select** a tenth time (the single dot is now located at the top, between the hour and minute); the peak of the cycle hour (usually high tide) will be displayed. Change as desired.



Press **select** an eleventh time (the single dot remains at the top between the hour and minute), and the minutes of the peak hour will be displayed. Change as desired.



Press **select** a twelfth time and the unit will return to normal display mode.

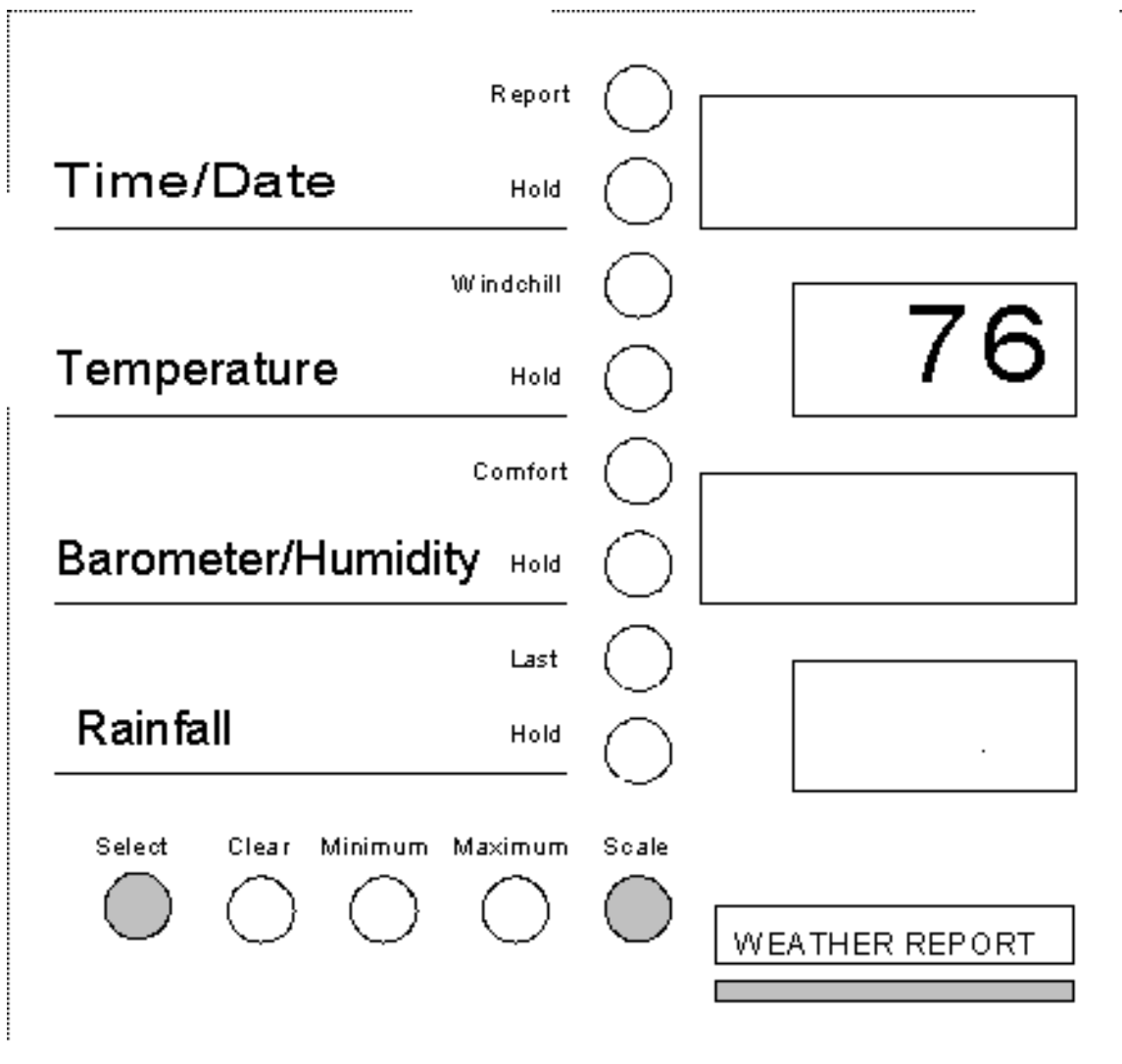
Calibration mode

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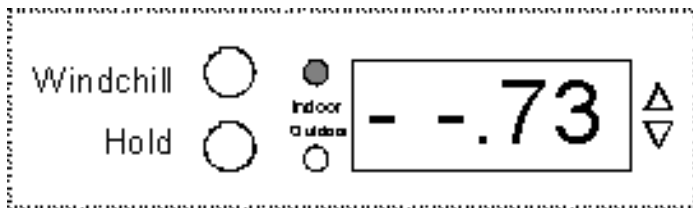
[See the calibration reference section on page 22 for other details.](#)

Calibration Method

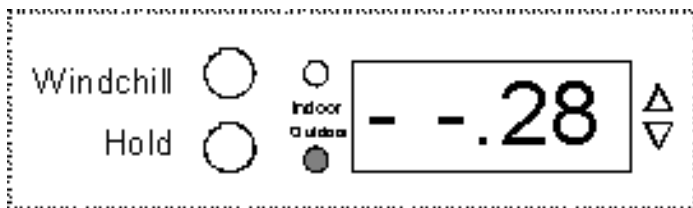
Press **select** and **scale** at the same time, and the unit enters the calibration mode, first displaying the Aux value. If necessary, press the **maximum** or **minimum** key to enter the proper temperature.



Press **select** a second time and the unit displays the indoor temperature. Press the **maximum** or **minimum** key to enter the actual temperature.



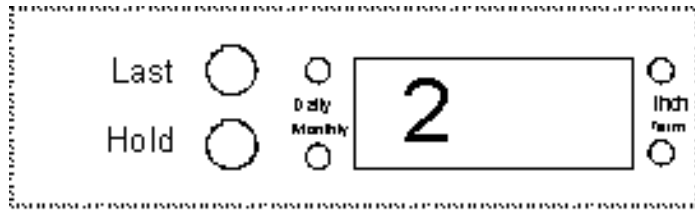
Press **select** a third time - the unit displays the outdoor temperature. Press the **maximum** or **minimum** key to enter the actual temperature.



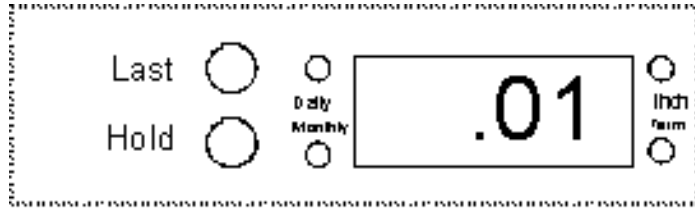
Press **select** a fourth time, and the unit displays barometric pressure. Press the **maximum** or **minimum** key to enter the actual barometric pressure.



Press **select** a fifth time, and the unit displays in the rainfall window: 0, 1, 2, or 3. 2 is the normal display. Press the **maximum** or **minimum** key to enter the proper number ([see calibration reference, page 23, for more information](#)).



Press **select** a sixth time; the unit will display in the rainfall window a reading ranging from .01 to .1. Press the **maximum** or **minimum** button to enter the proper number.



Press **select** a seventh time - the unit displays wind direction on the compass rose and the offset number in the temperature display. Press the **maximum** or **minimum** key to enter the actual wind direction.

Press **select** an eighth time - the elevation calibration number will be in the pressure window. Leave this set to 0.

Press **select** a ninth time - the unit will return to the normal display mode.

Humidity Sensor Calibration

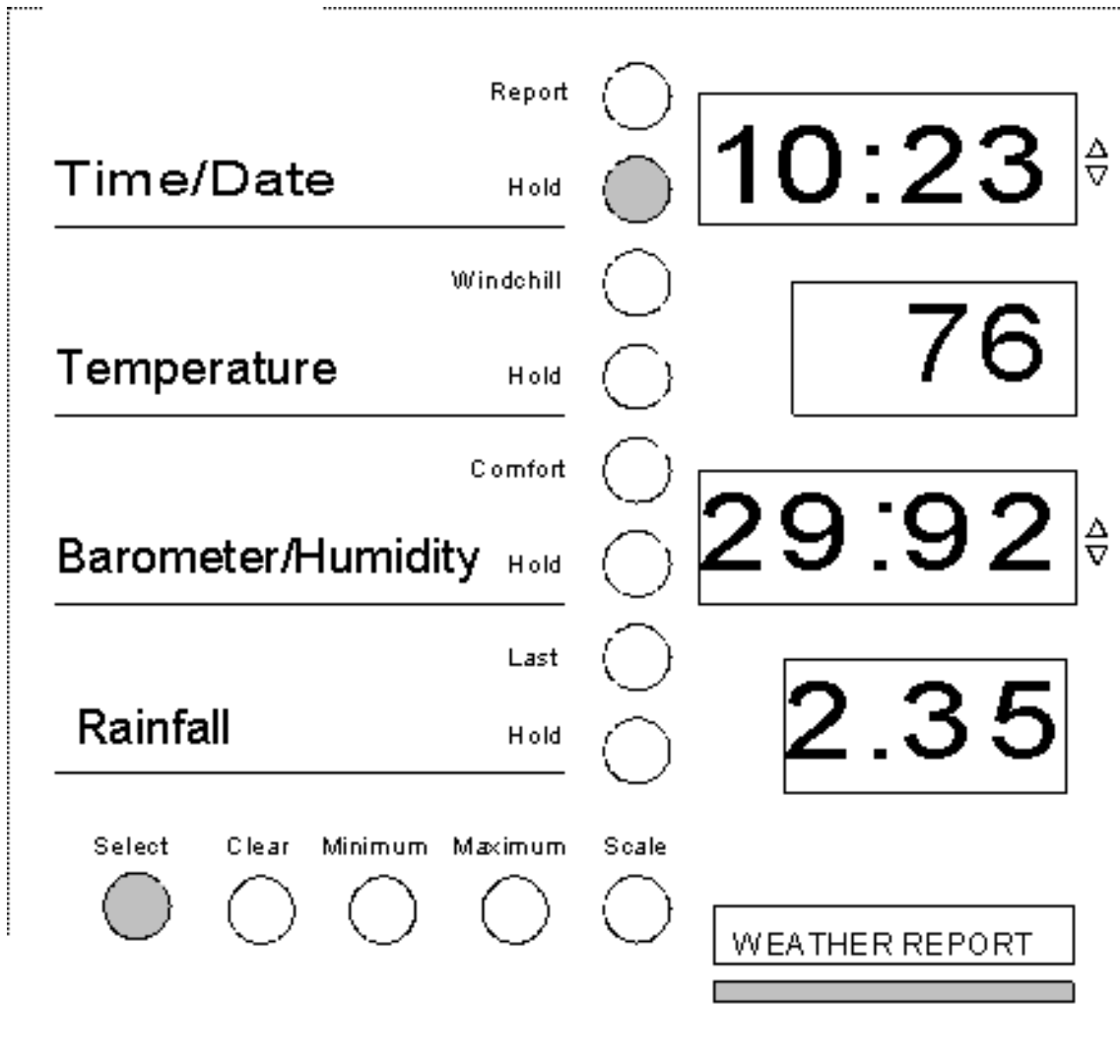
This function is only used if a new humidity sensor is installed. Press **select** and humidity **hold** to enter this mode. The first number to appear is the voltage at 0% humidity that the sensor outputs. Press **select** again and a second number will appear. This larger number is the voltage that the sensor outputs at 75% humidity. The humidity calibration numbers are found on the humidity/temperature sensor and on the back of the instrument console. These calibration numbers are supplied to us by the manufacturer of the sensor and are normally not changed.

Logging Mode

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Press **select** and **time hold** at the same time to enter logging mode (*note that all the trend*

indicators are on when in this mode).



Logging mode allows the user to view previously logged data via the display. (*You can only enter logging mode if there is data in the logging memory*). You may choose at what interval of time you would like the data saved through the *print set* routine ([see page 12](#)). Once in *logging mode* press the minimum and maximum key to move forward and backward through the data. The date and time of the line of data will be displayed in the *time/date* window. If you have a printer connected to the display, pressing the report key from within the logging mode, directs the WRL to output data from the data displayed point forward. Press select again to exit logging mode. The WRL will start writing over the oldest data records in memory with new data, when the capacity of the memory is achieved.

The TWI_LOG program supplied with this unit is a PC based software program that allows the user to access many features of the WRL that are not possible from the display. Please see the TWI_LOG ([page 15](#)) section in this manual for information.

Print Set

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There are two settings that will affect the deposition of data. The first, *report interval*, determines how often the WRL will automatically dump data to the RS-232 port. The second, *log interval*, determines how often the unit saves data to its internal memory.

Pressing **select** and **average** at the same time puts the unit into print set mode. The unit first displays the *report interval* in number of hours between lines of printed information. Press the **maximum** and **minimum** keys to change display.

Pressing **select** a second time displays the number of minutes between lines of information. Press the **maximum** and **minimum** keys to change the display.

Press **select** a third time, and the minimum/maximum and form feed options 0 through 7 may be selected as illustrated in the table below:

SETTING	MIN/MAX	FORM FEED RAIN RATE	
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.

Press **select** a fourth time to select the baud rate of the serial output. Press the **maximum** and **minimum** keys to change the display.

Press **select** a fifth time to select log interval hours. The log interval tells the *Weather Report* to send **data** to the internal memory and at what interval to do so. Press the **maximum** or **minimum** to change the display.

Press **select** a sixth time to select the log interval minutes. Press the **maximum** or **minimum** to change the display.

Press **select** a seventh time and a number between 0 and 255 will appear in the pressure/humidity window which represents **output** options. Enter the proper option number by pressing the **maximum** or the **minimum** keys. The output options control the selection of such things as AM PM, wind speed knots, auxiliary display and average wind speed output. ([Look at the first item in the reference section called control options for more information, page 20.](#))

Press **select** a eighth time and the unit will return to a normal display.

Communicating with the WRL

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The WRL via its RS-232 interface can communicate with computers running either the TWI-LOG program or standard computer communication programs. The WRL 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 070F 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.

Sample

MIN 07/24/90 SW 00MPH 070F 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 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

TO 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).

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. The following commands respond if the WRL 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

```
01/01 23:00 052F 053F 085F 000% 29.92" 00.00"D 000MPH NNE
```

date	time	temp	humidity	bp	rain	wind speed	direction
01/01	23:00	052F	053F	085F	000%	29.92"	00.00"D 000MPH NNE

TwI_Log Program

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The TWI_LOG program. TWI_LOG is an IBM PC software utility which enables the user with special applications to communicate and set various functions of the WRL. Insert the TWI_LOG diskette into your disk drive and type TWI_LOG then press enter.

Note: TWI LOG is no longer sent with the weather stations. The TWI Cal Windows program has replaced TWI_LOG and is included with the weather station. If for some reason you still need the TWI_LOG program it is available on our website at www.texas-weather.com.

• The first screen of the program will look this:

```
1 Com1
2 Com2
3 Modem
enter index of station name: ?
```

Pressing selection 1 accesses the WRL, if it is plugged into com1.

Pressing selection 2 accesses the WRL if it is plugged into com2.

Pressing selection 3 accesses the WRL via modems and phone lines.

WRL access can be modified by editing the **twi_com.dat** file on your TWI_LOG disk. To change the configuration load **twi_com.dat** into a text editor and change to your preference. The first station in this example is identified as green. It is set up on com 1 at 2400 baud, no parity, eight data bits and one stop bit. BIN, DSO, CD0, and CS0 are various configuration parameters that must be in the string. The TWI station is configured as a remote unit. A modem would be connected to com1 set at 2400 baud, no parity, 8 data bits and one stop bit. The ATE0QV1M1X4S0=0 is the modem configuration string required by this particular modem. The DT1,214,234-1309 is the phone number where the remote unit and its modem are located. Please note that TWI_LOG does not support Com3 or Com4.

```
Sample twi_com.dat file
Com1 COM1:2400,N,8,1,BIN,DS0,CD0,CS0
Com2 COM2:2400,N,8,1,BIN,DS0,CD0,CS0
Modem COM1:2400,N,8,1,BIN,DS0,CD0,CS0 ATE0Q0V1M1X4S0=0 DT1,214,234-1309
```

After you make your selection the following screen will appear:

TWI Main Menu	
F1	Report Output
F2	Retrieve Log Data
F3	Display Log Data
F4	Purge Log Data
F5	Display Cal Data
F6	Graphic Log Data
F7	Print Log Data
F8	Get Version again
F9	Set Date/Time
F10	Exit Program

Pressing F1 enables the user to communicate with the WRL using all the commands referred to in the Communicating with the WRL (page 14) Section of this manual.

Pressing F2 instructs the computer to retrieve data from the WRL and place that data in a file on the disk drive. Only new data will be written to disk during successive retrievals. Any number of WRL's or WPS' can be accessed and their data will be put in different files on the drive. There will be two files written on to your drive, log_day.??? and log_rec.???. Log_day. ??? has the minimum and maximum values and log_rec.??? has the individual records. Each file has a file extenuation that corresponds to the ID number of each weather unit. The ID number can be changed through the calibration (F5) routine in Twi_Log. For example if you downloaded data from a unit with the ID of 124 the data for that unit would be found in *log_rec.124*.

Pressing F3 displays the data written on disk. Press the up arrow key to go up or down one record

at a time, press the page up or down keys to display one screen of data at a time, press the home or end key to go to the top or bottom of the file. The delete key takes all records prior to that displayed at the top of the screen and transfers that data to an archive file **arc_log.???** file. The extension ??? will be the same as the unit number. The data that is archived is removed from the current display and log file.

Pressing F4 purges any duplicate data written on disk.

Pressing F5 -the calibration screen.

Inx	Value	Description	Inx	Value	Description
1	85	temp:aux	20	94	clock years
2	65	temp: inside	21	11	clock month
3	73	temp: outside	22	22	clock day of month
4	29.92	barometric pressure	23	2	clock day of week::Mon:
5	0	elevation	24	11	clock hours
6	0.750	MVP @ 0.0% HR	25	24	clock minutes
7	3.255	MVP @ 73.3% HR	26	54	clock seconds
8	8	wind dir. offset	27	0	log interval hrs
9	2	rain inc flag	28	30	log interval minutes
10	0.01	rain inc value	29	0	Scale: 0=FPS 1=CGS
11	0.00	rain fall: daily	30	0	ID number
12	0.00	rain fall: monthly	31	8	POR Counter
13	0.00	rain fall: term	32	0	RR Interval , sec
14	0	report interval HI	33	0	Wsp units : MPH
15	0	report interval LO	34	1	Time dispaly : AMPM
16	0	report Min/Max :Off	35	1	aux Temp
17	4	report end of day	36	1	Wsp/Wdir
18	0	report interval Units: M:S:	37	4	baud rate: 2400
19	0	report character: r	38		

enter parameter index: ?

Note: This screen and its index numbers will vary depending on what options are installed.

Any item in this index can be changed by:

- (1)entering the index number
- (2)entering the new value
- (3)entering Y to set the new value or N to reject the new value.

- 1) Aux temperature calibration
- 2) **Inside temperature calibration**
- 3) **Outside temperature calibration**
- 4) **Barometric pressure calibration**
- 5) Elevation correction (not used)
- 6)1st **humidity sensor calibration factor**

- 7) 2nd humidity sensor calibration factor
- 8) **Wind direction calibration**, increase number to move clockwise or decrease number to move counterclockwise.
- 9) **Rain collector type** (most rain collectors are type 2 including TWI, 0 turns of the rain collector counter)
- 10) **Rain increment value** (the value that is added for each click of the rain collector, most rain collectors should be set for 0.01 including TWI)
- 11) **Daily rainfall history register**
- 12) Monthly rainfall history register
- 13) **Term rainfall history register**
- 14) **Report output interval HI**, sets the automatic data dump interval to the RS232. Value can be in **hours** or **minutes** depending on the setting of the **report interval units** (19)
- 15) **Report output interval LO**, sets the automatic data dump interval to the RS232. Value can be in minutes or **seconds** depending on the setting of the report interval unites (19).
- 16) Report Min/Max turns on the min-max function for the log and the **report output** (for the printer).
- 17) Report end of **day**- sends a formfeed at midnight to the **RS-232** (for the printer).
- 18) Report Interval Units sets the ouput values to minutes or seconds.
- 19) Sets which command the report output will use, r, R, q or Q.
- 20) Sets the **years**..
- 21) Sets the **month**.
- 22) Sets day of month.
- 23) Sets the day of the week. (*1=Sunday, 2=Monday, 3= Tuesday, 4=Wednesday, 5=Thursday, 6=Friday, 7=Sunday*)
- 24) Sets hours in 24 hour format..
- 25) Sets minutes
- 26) Sets Seconds.
- 27) Sets the **logging interval hours** (*saves data in the units memory when set*)
- 28) Sets the **logging interval minutes**.
- 29) 0 for English or 1 for Metric scale
- 30) Sets the **ID number** (*0 through 255*)
- 31) Displays number of power ups (*0 through 255*)
- 32) Displays the **rainfall rate interval** in minutes.
- 33) **Wind Speed scale**, changes wind speed to knots when set to 1. A 0 setting when in English will output miles per hour and a 0 when in metric will output kilometers per hour.
- 34) **Time display**, when set to 0 the unit will display time in a 24 hour military format. When set to 1 the unit will be in AM or PM.
- 35) **Aux disable**, when set to 0 will cycle the temperature display through three values, indoor temp, outdoor temp and the aux value (aux temperature or solar). When Aux disable is set to 1 the temperature display will cycle through indoor and outdoor temperatures only.
- 36) Wind speed and direction, when set to 0 the unit outputs one minute **average wind data** to the RS-232 port. When set to 1 the output is instant. This setting does not effect the display which has its own button.
- 37) Selects **baud rate**, 0=38.4 1=19.2, 2=9600, 3=4800, 4=2400, 5=1200, 6=600, 7=300.
(Warning! Do not change this number unless you understand that you will lose communication with the WRL until the host baud rate is also changed. Also note that TWI_LOG does not support a baud rate fo 38.4.)

Pressing F6 will graph the data, if you have a VGA monitor.

Pressing F7 will take the current binary data file and convert it to a text file. The text file will be named **prn_day.???** for the minimums and maximums and **prn_rec.???** for the record. The extension of the files will correspond with the ID number of the weather unit whose record is being converted.

Pressing F8 will display the version number of the firmware in the WRL.

Pressing F9 will set the weather station time to match that of the computer.

Pressing F10 will exit the program.

Direct data retrieval from a DOS prompt may be accomplished by entering `TWI_LOG ? /dl`, where the ? equals the line of the unit as defined in the `twi_com.dat` file. For example entering `TWI_LOG 1 /dl` would access in our current setup the *Green* unit. Entering `TWI_LOG 2 /dl` would access the *Red* unit. After the data is retrieved the program will return to the DOS prompt. For automatic data retrieval of multiple units at a predetermined time a commercial PC scheduling program may be use.

You may look at data that is stored on disk even if you are not tied directly to that weather station by entering `TWI_LOG /ixxx` where xxx equals the ID number of the unit (the unit ID may be set using the F5 function key within TWI_LOG). At the DOS prompt `TWI_LOG /I135` would access the data for unit 135.

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Control Options

Control options can be changed through the print set routine, see page 12 for directions on changing this number. These control options can also be changed through the TWI_LOG program F5 screen. The first control option is wind speed scale. When turned on, the wind speed is in knots instead of the normal mile per hour or kilometer per hour when in metric scale. The second control option selects the manner in which the time is displayed. 24 hour military style or the AM PM format. When on, the AM PM style is displayed. Aux display disable is the third option, when it is on the temperature display cycles between the indoor and outdoor values only. If you do not have options such as aux temperature or solar radiation aux display disable should be turned on. Instant wind speed output is the fourth option. When turned on the windspeed output to the RS-232 port is an instant reading rather than a one minute average.

To turn on the desired control options via the weather station display, refer to the table below, add up the values of the controls that should be turned on and enter that value into the weather instrument via the print set function ([see page 12](#)). The default value is 224. For example if you wanted AM PM turned on and instant wind speed output turned on you would add 32+128 which equals 160. Enter 160 into the weather instrument via the print set function.

Option	Value	

Knots on	16	
AM PM on	32	
Aux disable on	64	
Instant wind speed on	128	
total		

You may also change these functions via the software program TWI_LOG F5 routine (see page 17).

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 . . .

Modem Installation

A modem may be used with the WRL for remote operations. A **modem adapter** which is available from TWI must be used to properly connect the weather station to a modem. For auto answering, an auto-answering modem with non-volatile memory must be used. The WRL does not send **AT control signals**, so in order for the modem to properly answer, the modem must be told (programmed with a computer) to answer on whichever ring the user desires. (Modems pre-programmed in non-volatile memory are available from Texas Weather Instruments.)

Typical Output

					Temperature					Daily Monthly Rainfall	
Time	Date	Direction	Speed	Aux	Indoor	Outdoor	Humidity	Pressure	Rain	Rain	Rate
15:00	07/24/90	SE	03MPH	070F	069F	082F	090%	30.04S	00.01"D	01.20"M	00.00"R
15:15	07/24/90	SSE	04MPH	052F	069F	078F	099%	30.04S	00.19"D	01.38"M	00.72"R
15:30	07/24/90	SE	02MPH	065F	068F	072F	089%	30.04S	00.19"D	01.38"M	00.00"R
MIN	07/24/90	SW	00MPH	070F	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

Computer Interface

The WRL with a null modem adapter, may be plugged directly into computers equipped with RS-232 interfaces. Data may be captured to disk by using a communication program (i.e., Crosstalk or Procomm for the IBM-PC) or the TWI_LOG program. The WRL sends data in a serial format at 300 to 19.2 baud rate, 8 data bits, no parity and one stop bit.

Note: The WRL 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 Reference

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The Weather Report comes pre-calibrated from the factory, but it is possible to recalibrate most of the primary functions of the instrument using the F5 function of the TWI_LOG 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. Remember, the WRL 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 humidity sensor into the WRL. This may be done by utilizing the TWI_LOG program calibration routine. Index 6 is the voltage at 0% humidity that the sensor outputs. Index 7 represents the voltage that the sensor outputs at 73% humidity. The humidity calibration numbers are found on the humidity/temperature sensor and inside the instrument console. These calibration numbers are supplied to us by the manufacturer of the sensor and are normally not changed. If it appears that re-calibration is necessary, try increasing or decreasing index 7.

Rainfall

The WRL is compatible with most rain collectors on the market today. The *rain inc flag* is only utilized to tell the WRL what type **rain collector** is installed. 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 WRL to react with one count for every momentary switch closure of the rain collector.

Setting 3 tells the WRL to react with one count for every rain collector switch transition from an open or closed state. Rain inc value tells the WRL how much rainfall to display for each count. Use the TWI_LOG F5 calibration routine to change these settings.

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 TWI_LOG calibration routine or by pressing **last** and **clear** on the display at the same time.

Report Flag

The report flag selects the format of the RS-232 output and may be changed via the display using the print set routine or by using the TWI_LOG program calibration routine (F5) item 16 report flag. *(normally used when outputting directly to a printer)*

SETTING	MIN/MAX	FORM FEED	RAIN RATE
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.

Special Key Functions

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Select + Report = Time Set Function

Select + Scale = Calibration Set Function

Select + Average = Printer Set Function

Select + Humidity Hold = Humidity Calibration Set

Select + Time Hold = Logging mode

Clear + Last = Clears Last Rain

Select + Last = Enters Rainfall History Mode

Clear + Maximum = Clears all Maximums and Minimums

Clear + Minimum = Clears all Maximums and Minimums

Clear + Scale + Average = Performs a cold boot

Windchill + Comfort = **Dewpoint**

Keys must be pressed precisely at the same time to perform the desired function.

Lunar Tide Cycle

The lunar tide cycle function may be set to display the position of the moon in relation to its revolution around the earth. The moon's position is the primary, although not the only, factor in predicting high and low coastal tides. High tides are generally present when the moon is overhead or when the moon is 180 degrees from overhead. Low tide is generally present when the moon is in the 90 degree or the 270 degree position. This method of predicting tide works well on the West and East coasts. On the Gulf coast, this method is not as successful.

To set the **tide clock**, follow the directions in the time set function. The first item to be entered is the tide cycle duration. The tide cycle duration may be set from 1 to 99 hours. Twelve hours and fifty one minutes is the normal number for a tide clock. The second item to be entered is the time of the high tide. This information is generally found in the newspaper. If predicting the tide does not apply to your area, any cycle that lasts between 1 and 99 hours may be displayed.

Clearing the Memories

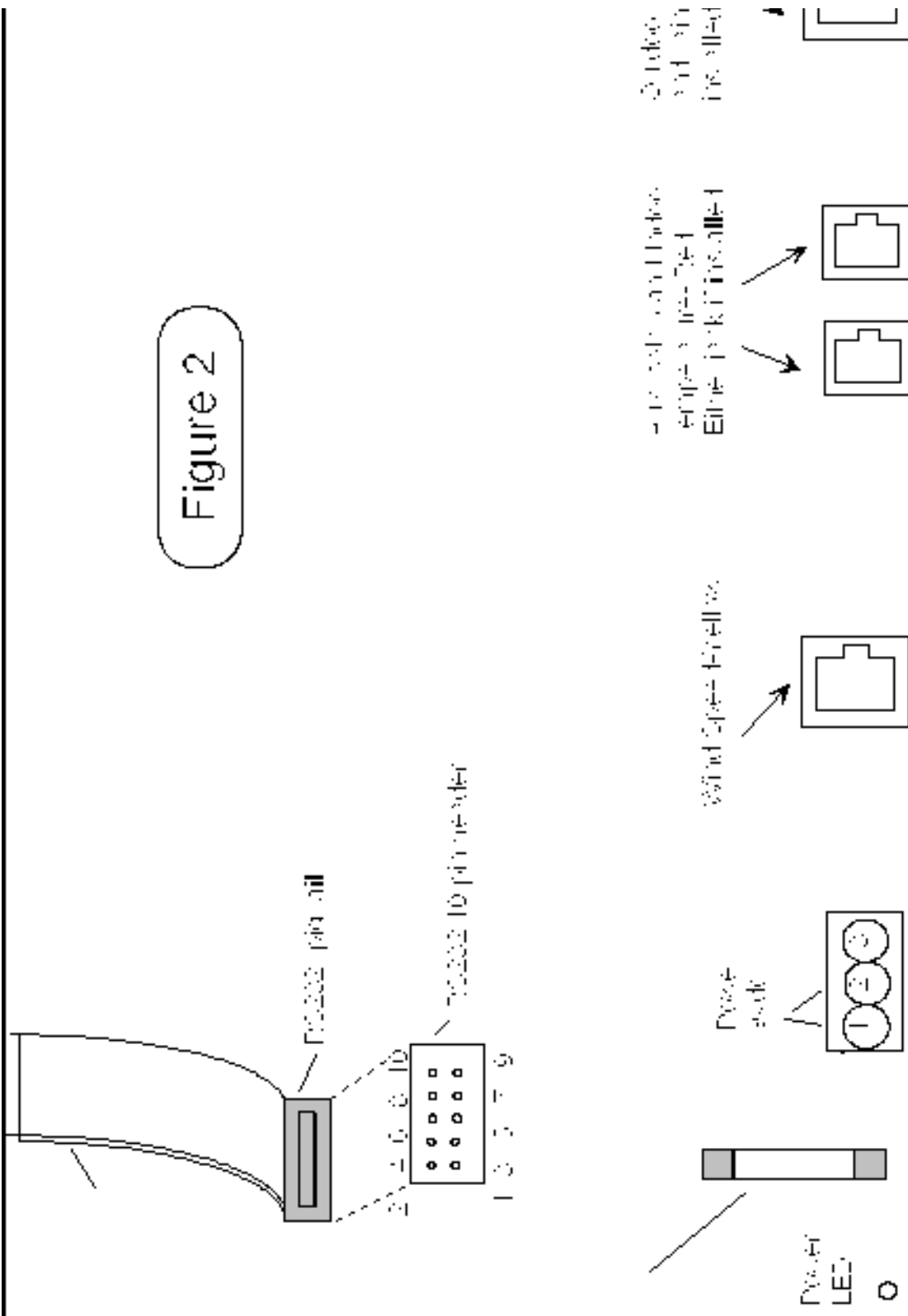
When the **clear** button is depressed and held, the unit will display the date and time the instrument's memory was last cleared. In order to clear the memories, the **clear** and **minimum** button must be pushed at the same time. The items cleared are as follow: minimum and maximum, wind speed, temperature (indoor, outdoor, and aux), barometric pressure and humidity. Daily rainfall is cleared automatically at midnight every night. Monthly rainfall is cleared automatically at midnight on the last day of the month. Term rainfall may be cleared at any time by the user by depressing **clear** and **last** rain at the same time. The term rainfall register may be used for any term desired by the user, but is most commonly used to account for yearly rainfall. The memories can also be changed by using TWI_LOG.

Rainfall history mode

If the information is available, the actual daily, monthly and term rainfall amounts that occurred before the installation of the weather station may be manually entered. To do so enter the rain history mode, by pressing **select** and **last** at the same time. The first item to appear will be the dally rainfall total. Press **minimum** or **maximum** to input the correct amount. Press **select** again and the monthly rainfall amount will appear. Press **select** again and the unit will display term rainfall, change as desired. Press **select** again and the unit will return to normal mode.



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, 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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Troubleshooting

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Instrument display does not come on.

Make sure receptacle has power by plugging another appliance into it. Check that the transformer is properly wired into instrument (the leads could be reversed or not seated properly). Check that the fuse is intact (.75 amp fuse inside the case). Try unplugging the transformer to reset the computer.

Instrument display works but does not read correctly.

Make sure you are displaying the proper scale (English or Metric).

Check that all connectors in the back of the unit are properly seated and that sensor wires are on their proper junctions and secure (see to Figure 2).

Try unplugging then replugging the transformer to reset the computer.

Check the fuse in the back of the instrument. If it feels hot, replace with a .75 amp fuse available at most electronic stores.

Humidity reads 0% during the day.

If your humidity sensor is in a plastic box, make sure that is in the shade and has the cover attached (does not apply to pagoda installations).

Rain collector appears to be counting double that of the actual rainfall.

Check that the rainfall count is set on 2.

If you still experience problems, please call (214) 368-7116 and ask for Technical Support, we will be happy to help you.

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