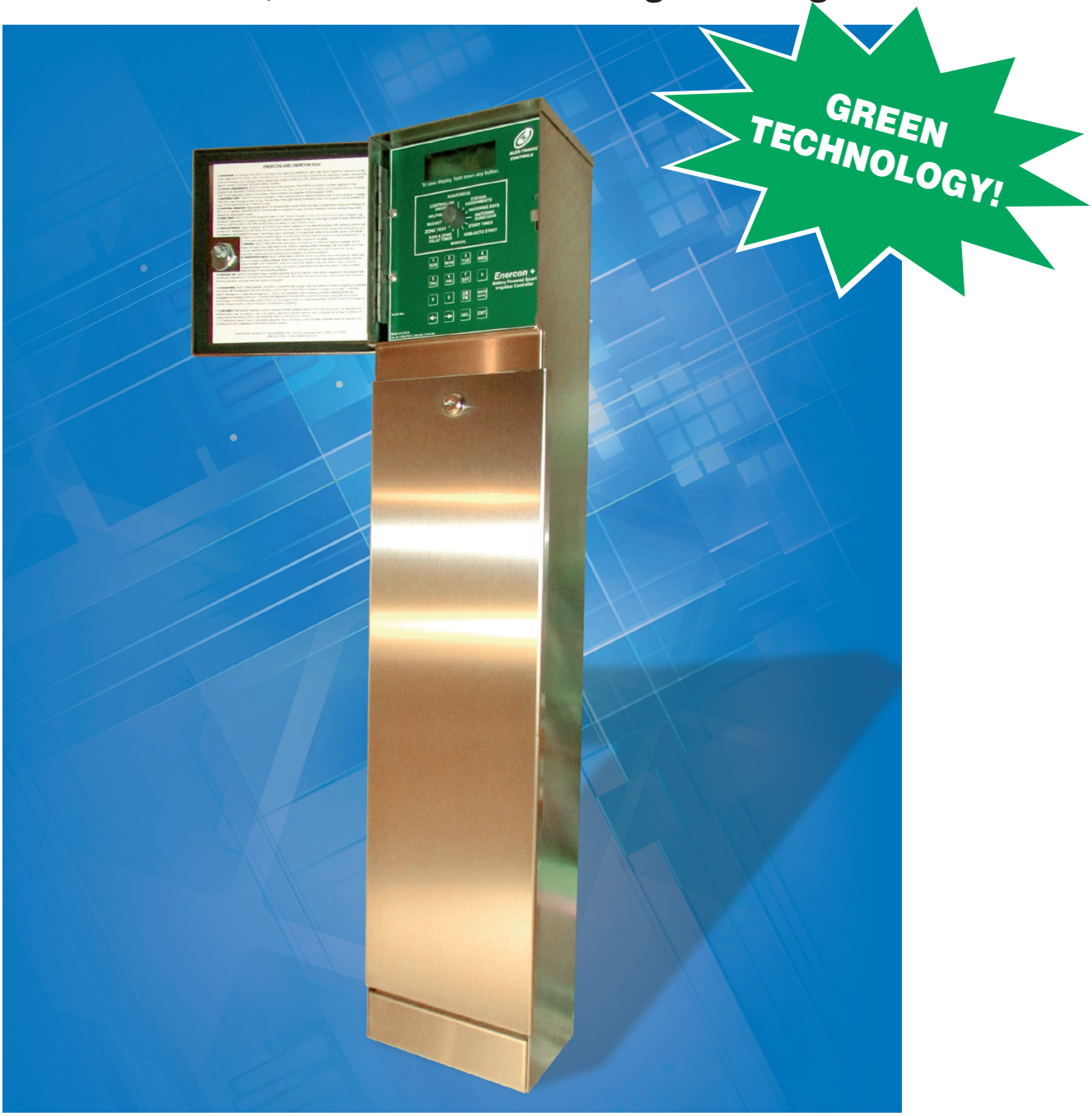
ENERCON +

Battery Operated Irrigation Controller

With Set It, Don't Sweat It® Programming



USER'S MANUAL

Patents # 7,058,478, 7,266,428, 7,844,368, 7,844,368 and 8,401,705

Please fully read all instructions prior to installation and use.

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INTRODUCTION:

Thank you for purchasing the Alex-Tronix Enercon+ Controller. The Enercon+ is a commercial battery powered smart irrigation controller, housed in a stainless steel pedestal, and can operate up to 24 stations. A newly designed, longer lasting battery pack now comes standard. Additionally, the capability of using a 9V battery for short term emergency operation also has been implemented into this new version. Since a solar panel is not required to operate the unit, maintenance and vandalism are minimized, plus the controller can be installed in shade, indoors, or under cover. The Enercon+, manufactured in the U.S. by Alex-Tronix, uses proprietary technology recognized by the U.S. Department of Energy. The Enercon+ has been certified for water efficiency under the Smart Water Application Technology "S.W.A.T." program and may qualify for cash rebates by many water districts. **Please check with your local water district to apply for any rebates available.**

INSTALLATION PROCEDURES

MOUNTING PROCEDURE FOR EXISTING INSTALLATIONS (REFER TO FIG. 1):

Please read the steps below to note what tools and materials you will require before beginning installation.

For existing installations that have a concrete pad ready to use, remove old controller and any existing mounting bolts etc. After preparing the area for installation, check if large concrete divots remain after removing. If so, use a fast drying concrete patch such as "pour stone" to tidy things up; let harden. Protrude all wires through existing pad and place the mounting base plate flat on the concrete pad centered around field wires. Using the provided base plate as a stencil, mark each bolt hole on the cement pad, and remove base plate.

Step 1) Using a star drill punch, and a 5/16" sized masonry drill bit, drill six holes into the pad approximately 2" deep. Remove cement dust out of the holes thoroughly.

Step 2) Now take 3/8" x 1-3/4" sized, lead concrete anchors ("Lag Shields"--purchased separately) and lightly tap into each hole until flush with surface.

Step 3) Gently lie controller on its back, remove bottom door, and protrude all field wires through the bottom of the pedestal.

Step 4) Stand up and align controller over the anchors. You will also need six of each: (3/8" x 1-1/2") sized lag screws, and (7/8" dia. x 3/8" hole dia.) -- flat steel washers.

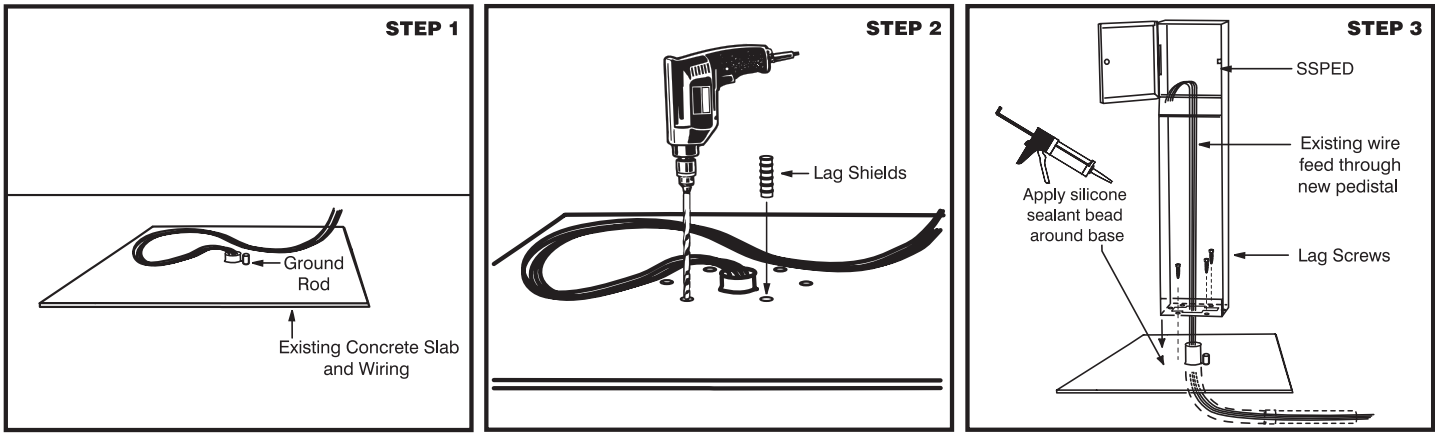
Step 5) With the pedestal standing in place, slip a washer over each lag screw, and insert lag screw into each anchor from the inside of the pedestal. Use a ratcheting socket wrench to securely fasten the pedestal down on to the concrete pad. If there is significant gapping between the pedestal base and the concrete pad, a bead of silicone sealant may be caulked around the base of the pedestal. This should be standard practice and will help keep moisture and insects out of the controller.

MOUNTING PROCEDURE FOR NEW INSTALLATIONS:

The following cautions should be observed:

- ✔ DO Electrically "ground" controller using a grounding rod in areas susceptible to lightning and static damage. The factory installed lightning protection option (LP) is recommended in those areas.
- ✔ Do not install the Enercon in a location that will continuously be exposed to sprinkler spray.
- ✔ Do not install the Enercon in a area susceptible to vehicle damage.

FIGURE 1



- ✔ Do not install the Enercon near underground high voltage or other utility wiring. Check with local agencies for cable and wire locations.
- ✔ Do not allow dirt, water, etc. to enter the controller. Keep controller doors locked.
- ✔ Do not spray any cleaners/lubricants into controller.

Step 1) After selecting a location for the controller, excavate an area in the soil with the dimensions of 3' X 2' X 1' deep. Depending on the number of wires, place two 1-1/2" or one 2" diameter, long sweep ell pipe(s) centered in the hole with about a two foot extension laying in the trench. Ensure pipe(s) are vertical with a 4 inch clearance above ground level. If you will be installing a rain sensor (optional accessory available from other manufacturers) now is the time to make additional room for a separate underground conduit.

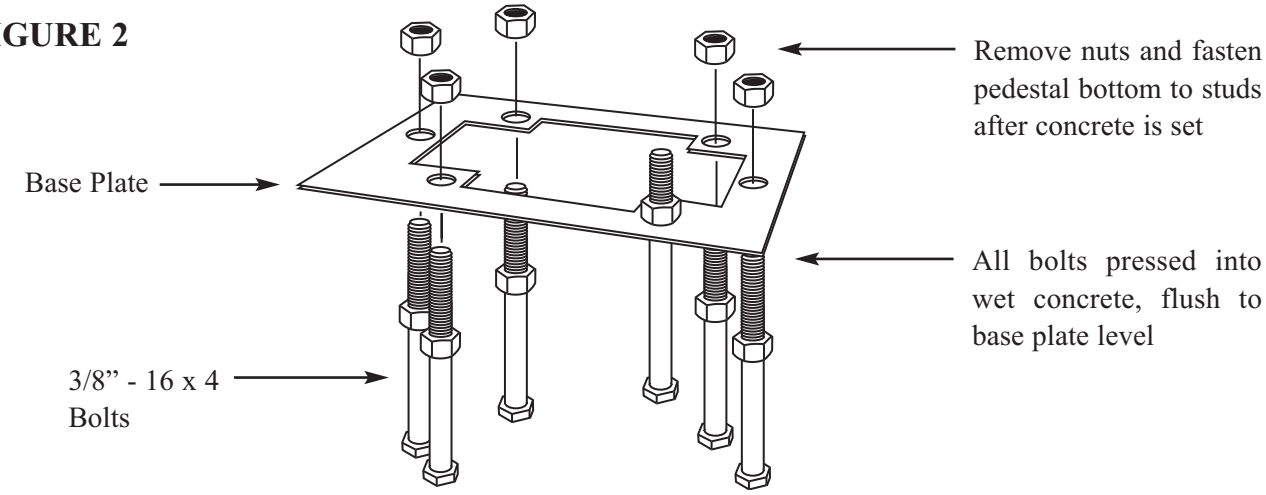
Step 2) Though the Enercon is electrically isolated from power utility providers, it is highly recommended that a grounding rod be installed to help reduce static electricity charge build up and lightning strike damage. If your area is prone to this, then a grounding rod should be installed under or near the pad and at least a 10 AWG wire brought up through the pedestal a few feet; it must be connected to the marked green ground wire on the output board. If you ordered the Enercon with the lightning arrestor gas tube option, you must use a ground rod for adequate lightning protection.

Step 3) Finally, back fill the hole with soil to a depth of about 5 inches leaving the pipe extension open in the trench.

Step 4) Using 2 X 6 studs, build a wood form to the dimensions of 3' X 2'. Rough in the wood form flush to the ground, and check with level. The form should be slightly above sod/ground level so water does not collect on pad.

Step 5) Prepare base plate by taking all six (3/8"-16 x 4 hex) bolts and threading a 3/8" nut on each one until the nut stops against the un-threaded part of the bolt. After this is done, insert all the bolts through the base plate holes from one side and fasten using a second nut for each bolt. The base plate with anchor bolts are now ready to be pressed into the wet concrete form. Use a level to align straight. SEE FIGURE 2 below.

FIGURE 2



Step 6) Prepare fast setting concrete and pour into form, around conduit(s). Immediately trowel and insert base plate with bolts (bolt heads into concrete) and collar around conduit(s). The bracket should "float" on the concrete surface. Verify no tilt by using a level. Allow concrete to set-- typically 1 hour. Troweling should be done in a manner to allow collected water to tread off from pad.

Step 7) After pad has cured, remove exposed nuts from bracket. Carefully lie controller on its back, remove bottom door, an protrude all field wires through the bottom of the pedestal. Stand up controller and place over the exposed studs -SEE FIGURE 3 (next page). Put washers on all the studs inside the pedestal chassis, then fasten down with included 3/8" sized nuts. Tighten all nuts down using a ratcheting socket wrench.

ELECTRICAL WIRING:

NOTE: Please observe all building codes mandated by your locality.

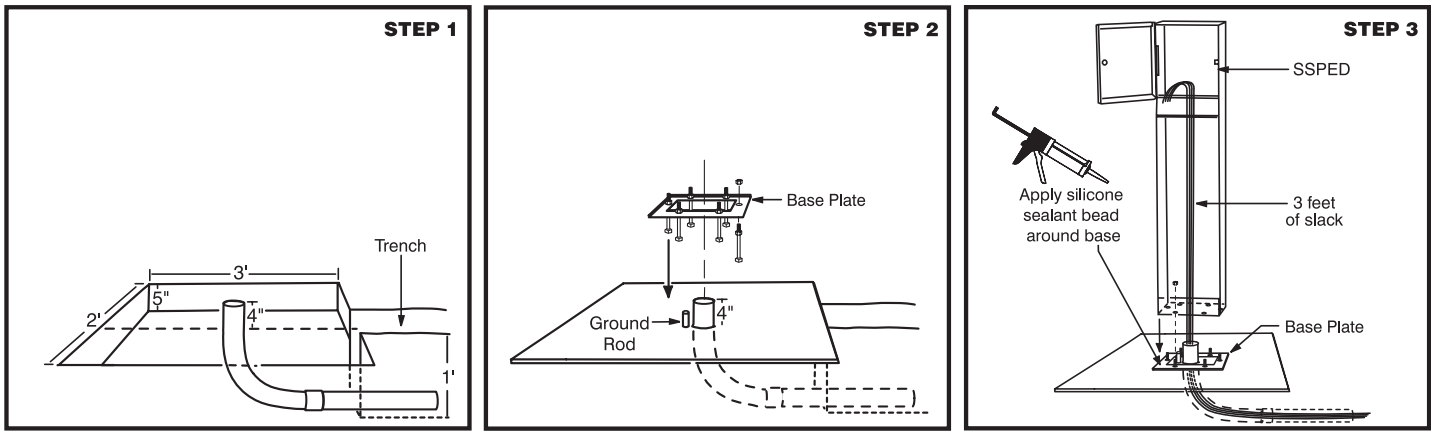
Existing, and Pre-Existing Field Wiring Schemes.

Before installing the Enercon+ controller, you will need to evaluate the wiring plan. If the system was previously a DC latching system, connect the field common wire(s) to any of the Enercon's common "C" terminals. The majority of latching solenoids manufactured denote (+ or Red) wire connected to station terminals, and black (- or NEG) wire connected to the common terminal(s). If you are retrofitting an existing A/C system to the Enercon+ system, the same field wiring may be used, providing wiring polarity is correct. It is imperative that all the "common" wires are truly common. This may become a problem if a common wire ties into a junction box somewhere out in the field and was incorrectly crossed within the junction box, which still allows an AC system to work, but may now have to be corrected for a DC system. Typically, a white wire is used as a common in AC systems.

A good way to verify polarities once the Enercon+ is installed, is to run the STATIONS TEST function and observe performance. If a few valves operate erratically, or turn on when they should turn off, check connections and polarity.

For new wiring, always use a separate colored wire for the common (typically black). It is also good practice to color code station wires or at the least, mark them. This will allow you to trace wires for easier troubleshooting.

FIGURE 3



Controller:

If valve number field wires were previously not noted, mark them at this point. Wire marking kits are available at electrical supply retailers. If field wires are from an existing system, they should be inspected and re-stripped. Good clean connections to the terminal strip are crucial. For new installations, use 14 AWG UF (direct burial) SOLID CORE WIRE. **WIRE SMALLER THAN 14AWG NOT RECOMMENDED.**

Start with wiring station terminal 1 and continue down with the rest -- up to 24. Bend all wires at right angles and strip all wires approximately 3/8". Good clean wire routing is important for ease of troubleshooting. The output board has five commons available for use. Connect all commons ("C") after individual stations are wired. If a ground rod was installed, connect ground rod wire to the green ground wire ("pigtail") located at the bottom of the output board.

NOTE: All commons marked “C” on output board’s terminal strip are electrically “tied” together on the output board itself. Using all “C” terminals is not necessary. Additional “C” terminals are provided for convenience and ease of wiring.

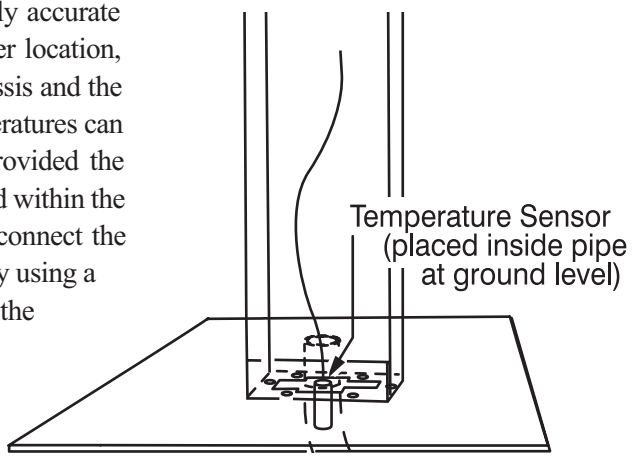
Rain Switch:

If you are using a rain switch (not provided), note that the wiring will be slightly different with this controller. FOR THE ENERCON+ CONTROLLER, DO NOT BREAK OR JUMPER ANY COMMON WIRES FOR RAIN SWITCH INSTALLATION. The Enercon+ has two dedicated input terminals marked "RAIN SWITCH" on the small output terminal, located beneath the nine volt battery. You must use the N.C. (Normally Closed) connections from the rain switch. The rain switch must also be activated through the HELP/INFO function (See HELP/INFO function sub menu -- Rain Switch Enable).

Temperature Sensor (refer to fig. 4):

The Enercon+ comes with a temperature sensor designed to be placed partially into the field wire conduit inside the chassis. This location yields a relatively accurate temperature reading without having to install an external pole at another location, increasing installation labor. With the temperature higher within the chassis and the ground being at a lower temperature, the balance between the two temperatures can represent a relatively accurate “ambient” temperature measurement provided the sensor is placed correctly within the conduit. The sensor should be tucked within the field wires in the conduit **at ground level.** Once the sensor is placed, connect the both wires to the special terminal marked TEMPERATURE SENSOR by using a small screw driver. Use the small screwdriver to loosen and cinch down the sensor wires into the connector. The sensor is used when temperature budgeting is active on the controller. This is when the Enercon becomes a “smart controller”, and optimum water saving benefits are achieved.

FIGURE 4



Solenoids:

The Enercon+ only operates DC LATCHING type solenoids. **DO NOT CONNECT A/C OR NON-LATCHING DC SOLENOIDS TO THE CONTROLLER.** It is highly recommended that the *latching solenoid* made or recommended by the valve manufacturer remain with their valve in order to avoid any solenoid/valve compatibility issues. If no latching solenoid is available for use with the valve specified on the job, then using the Alex-Tronix LS solenoid is the second option. If using the Alex-Tronix LS, fasten to valve using procedures stipulated by the "Valve Compatibility Chart" provided by Alex-Tronix.

All latching solenoids have a *polarity*. Typically, black wires are all connected to the common "C" terminal. The remaining red wires are connected to stations "1 through 24." If there are doubts about the polarity, a solenoid can be directly connected at the Enercon's output board terminal strip and tested in **MANUAL**. Correct operation is: On "latch"-- the plunger will pull in (Water flows through valve); on "release"--plunger will pop out. (Valve shuts off). You will not always be able observe plunger action depending on who manufacturers the solenoid; in this case, it is suggested the manufacturer of the solenoid be contacted for correct polarity and color coding.

When connecting field wires to solenoid wires, make sure the connection is GOOD, CLEAN and TIGHT. Use gel filled wire nuts only. Mark the field wires at the solenoid to denote polarity. If junction boxes are used in the field, make sure that the wires are not "crossed" in the box. Correct polarity must be observed, otherwise the solenoid will not operate properly and the valve will actuate in reverse of what is expected. - It may open, when it should be closed.

Note: If you have an application requiring a normally closed valve, such as a master valve to remain closed when there is no irrigation, you can wire the latching solenoid in reverse. The valve should be marked so as to not confuse anyone for future servicing.

OUTPUT TERMINAL BOARD (Refer to figure 5):

Output Modules:

The Enercon+ uses output driver modules for ease of expandability and service. Each module can drive 4 solenoids, starting from top to bottom order: **M**, Stations: **1-4, 5-8, 9-12, 13-16, 17-20**, and **21-24**. To replace or add modules, remove the lower door panel, then pull module(s) straight out. When a module is removed, you will notice a color designation printed on the output board. All station modules are colored green and can be swapped for field trouble-shooting purposes. A special module (master valve) with a yellow cover is at the very top. It must remain only in that position. Replace new modules by gently aligning connector and pressing straight in against button fastener.

Temperature Sensor:

It is highly recommended to use temperature budgeting. The Enercon+ comes standard with a pre-installed temperature sensor; (See Temperature Sensor installation under Electrical Wiring)

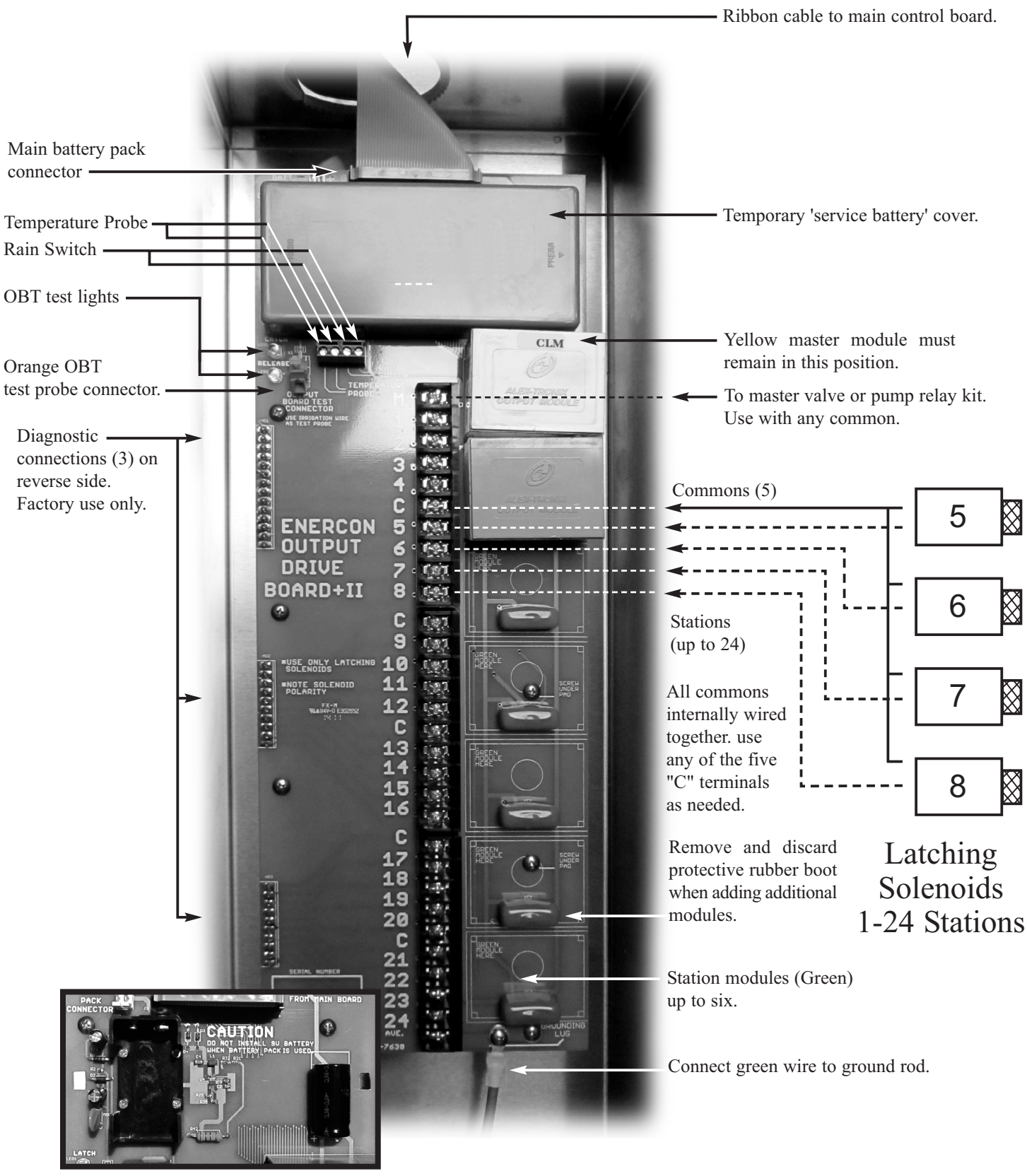
Operating Characteristics:

The Enercon+ is an energy efficient battery powered controller. If several valves are programmed to come on at the same time, they will actually activate sequentially, several seconds apart from one another. Activation times can be from 3-8 seconds depending on the condition of the battery. Whenever a station or program is activated by MANUAL, SEMI-AUTO, AUTOMATIC, or TEST CYCLE, there is always at least a 3 second delay before any solenoid is activated. The solenoid activation order is as follows: station solenoid output comes on first, then master valve. When valves are to be turned off, the reverse order occurs with the master, and station solenoid shutting off, each 3-8 seconds apart. If more than one program is scheduled to start at the same time, the first station assigned to program A will come on first, then the first station in Program B, then C, then D.

Master/Pump Connections:

When controlling a pump (or other auxiliary device), an optional pump interface kit (P.I.K.-S) available from Alex-Tronix, must be used. It is connected between a common "C" and master "M" output terminals. The relay can then "make" or "break" a circuit to control a pump or other device. For this option, contact factory for part availability and connection details.

FIGURE 5



Top of the terminal board showing temporary 9 volt service battery location (cover removed.)

Output Board Test (OBT) Terminal:

The small orange colored terminal located at the top of the output terminal board (See Fig. 4) marked: "USE IRRIGATION WIRE AS TEST PROBE" is used to self-test the outputs of the Enercon using the **OUTPUT BOARD TEST** (OBT) function located under the **HELP/INFO** menu. (See **HELP/INFO -- OUTPUT BOARD TEST**).

Battery Pack Connector:

The male connector on the output board marked: BATTERY PACK, is where the battery pack's female connecter is plugged into. The battery pack is placed in the chassis' upper compartment behind the main panel, and the pack's connector protruding through the bottom hole.

Service Battery:

On the output board, located under the green battery cover is a 9 volt battery holder. This service battery is only installed in an urgent situation where irrigation can not be interrupted, should the main battery pack become depleted. **IMPORTANT:** Note the service battery is **NOT** a back-up battery; therefore, do not install it while the battery pack itself is installed. See "Service Battery Replacement" for more information.

ENERCON PANEL CONTROLS AND PROGRAMMING:

Programming capabilities:

- From 4 to 24 stations.
- 4 programs with four start times per program.
- Watering Days or Days Interval.
- Water Durations up to 23 hours and 59 minutes per stations.
- Up to four independent Automatic or Semi-Auto starts can be initiated and overlapped.
- Manual Starting of any station.
- Rain Delay & Station delay.
- Automatic Valve testing feature.
- Monthly, manual and temperature budgeting.
- Minimum Temperature (Freeze) Shutdown.
- Help and configuration menu.

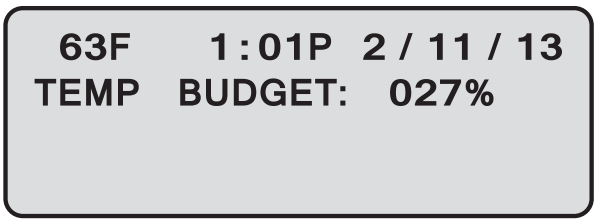
The Enercon+ uses hybrid keypad and rotary knob programming for ease of use. The keypad allows fast data entry, while the function selector knob gives the feel of user friendly mechanical controllers. The function knob is where all the program information is viewed and entered. The keypad is used to input program data. Any entry that can be selected or adjusted on the display has an asterisk symbol "*" next to it. Using the **SEL** key advances the cursor within the selected function. Please note that during programming, if you turn the rotary knob off of that position before pressing enter, the entered data will be lost. Let's proceed with each function.

To view the display, hold any key down until display appears.

Run/Status (See Display A):

This knob position displays what the controller is currently doing. If only the date and time are displayed, then the controller is idle, and waiting for the next start time. Change the time and date on this function as follows:

Display A - No Active Stations, Temperature Budgeting Selected (recommended)



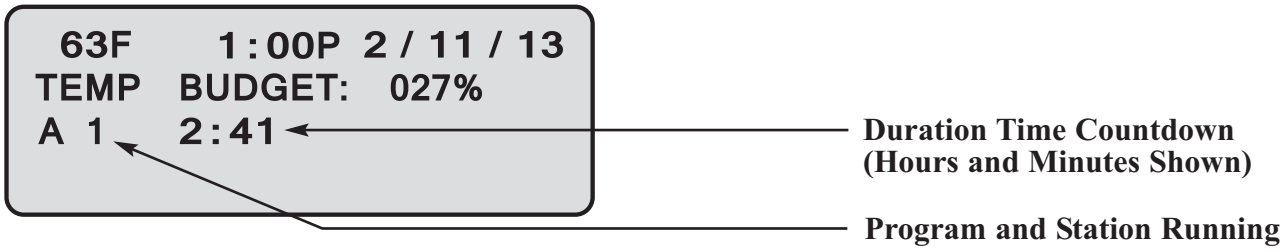
With display shown above, the controller is idle, and awaiting the next start time. Change the time and date on this display as follows:

TIME OF DAY AND DATE: To enter, change, or correct time of day, press **SEL** on keypad. You will see a blinking cursor on the display where the time is located. Using the keypad, enter in the correct time of day and press the key marked **AM/PM.** Times that are less than 10 hours must have zero entered in first before the next number....For example: 09:23AM..

Press **SEL** again. The cursor will now move to where the date is located. Enter the date in the following format: **MM/DD/YY**. After pressing **ENT**, the actual day displayed (**Su, Mo**, etc.) will set itself, because the Enercon+ has a built in calendar. The Enercon's calendar accounts for leap year but not daylight savings time. You must reprogram the correct time if your locale follows DST.

When program is running, the display will appear as shown below:

Display B - Active Station(s) With Temperature Budgeting



The **RUN/STATUS** display also provides additional information. When the Enercon+ is executing an automatic or semi-automatic program, you will see what program is running, which station is on, and the remaining watering time. The display may show up to 4 programs/stations running at the same time. Other information that could be displayed may be: UNIT IN MANUAL, UNIT IN TEST, CHANGE BATTERIES, RAIN DROP ICON, CONTROLLER OFF, RAIN DELAY, STATION DELAY, CHECK TEMP SENSOR, TEMPERATURE BUDGET, MANUAL BUDGET, MONTHLY BUDGET, and a % sign indicating duration times are budgeted.

When all programs have finished, the display will show the time, date, and day. It is not necessary for the function knob to be left on the **RUN/STATUS** position for normal operation.

NOTE: When any BUDGETING is active, the RUN/STATUS function will display the current temperature after 1 hour on the top left corner of the display, along with the budget method and daily calculated percentage on the second line.

Station Assignments:

For a station to operate a valve in Automatic, Semi-automatic, or Test mode, stations must be assigned to at least one program. To assign stations, press the **SEL** key. The cursor is now located on program **A**. If you continue to press **SEL**, the cursor will scroll through programs **B**, **C**, **D**, and back to **A** again. After selecting the program letter, press **ENT** to go into the station assignments display for the related program.

You are now in the station assignment area for the selected program. In the lower right hand corner, you will notice a cursor. This is where the station numbers are initially entered. For example, to assign station number 3, press 03.

To assign stations, key in the stations two numerical digits within succession up to 24. If you key in stations any higher than the controller is capable of, you will see ## (pound sign) in the lower right corner of the display. If the station entered is valid, the station will illuminate on the display at its designated location. You may continue to add additional stations as needed. When finished entering stations, press ET to go back to the **SELECT PROGRAM** display. From this point you can either select another program to assign stations to, or go to another function. If **ENT** is not pressed after any function screen programming is completed, the display will hold the previous screen settings.

NOTE: If you cannot program stations any greater than expected, check the **OUTPUT BOARD STNS** configuration setting under the **HELP/INFO** menu which determines how many stations are available.

Watering Days:

When rotary knob is set to **WATERING DAYS**, you will have two choices; actual watering days or days interval on any program. If WATERING DAYS or DAYS INTERVAL are not programmed, the controller will not operate in automatic mode.

SETTING WATER DAYS: To set **WATER DAYS**, press the **SEL** key. You will notice the cursor flashing on program **A**, indicating the selected program. Press **SEL** repeatedly to advance to the other programs. Once you have selected the program, press the keys marked with the day names on them; **Sun**, **Mon**, **Tues**, etc. Pressing each one of these keys illuminates the watering days on the display. Pressing the same key removes that day. Once all the watering day selections have been made, press **ENT** on the keypad to enter in all the days on all programs.

SETTING DAYS INTERVAL: Days interval, also located under the **WATERING DAYS** function sets the number of days to skip watering. To set **DAYS INTERVAL**, press the **SEL** key. You will notice the cursor flashing on program **A**, displaying which program you are in. Press **SEL** repeatedly to advance to any the other program. Once you have selected the program, press the key marked: **DAYS ITVL**. When the days interval option is displayed, you can change the number of skipped days-- entered on the keypad from 1 to 99 days. When finished, press **ENT** to enter all four programs on the display. Watering begins with the same day the interval is programmed as long as the start time(s) have not yet occurred. If you make any change to any of the four programs (A-D), the programs assigned to the interval of days will reset and a new starting day begins when you press enter.

Watering Durations:

To set watering duration for all stations, select any bank (1-6, 7-12, 13-18, 19-24) by pressing **SEL**, then **ENT**. Once you are in the desired bank, Press **SEL**, then **SEL** again or **LEFT/RIGHT (◄ ►)** arrows to navigate between stations. Once you select the desired station(s), key in the water time anywhere from 1 minute to 23 hours--59 minutes. After setting all the station watering durations, press **ENT** to enter in the complete display. The display will return to the bank selection menu where you can either select another bank or go to another function using the function selector knob. All watering durations must be set with 4 digits. For example, 15 minutes is entered as 0015 or one hour and 20 minutes would be 0120.

Budgeting information "%" is also shown in the center of the WATERING DURATION display. This is informational only, and displays calculated durations. Even when the durations are budgeted, you can change them "on the fly" without changing the budget back to 100%. To do this --while in WATERING DURATIONS, press **SEL** and the duration base times appear. Use SEL or ARROWS to move from station to station, then key in the modified time. When you are finished, press **ENT** to lock in the revised durations.

The display will revert back to the actual budgeted run times. As budget settings are changed (manually or automatically), duration times change accordingly. For more on this, see budgeting below.

NOTE: If you expect to advance to the next station and cannot, check the **OUTPUT BOARD STNS**. configuration under the **HELP/INFO** menu, and make sure it is set correctly.

Start Times (Automatic):

For automatic operation, at least one station with a watering duration, a watering day, a start time, and assigned to at least one program must be entered into the Enercon. If any of these parameters are missing, automatic starts will not occur.

The Enercon+ has four programs with four starts per program, so a total of sixteen starts for each station are possible per day. To set start times for programs, select programs **A&B** or **C&D** by pressing **SEL**, then **ENT**. Now repeatedly press **SEL** to select (or right-left arrows) to select any program letter. Once you have selected a letter, use the keypad to enter in the start time, then press **AM/PM** for the time of day. Continue to enter in desired start times, then press **ENT** to enter the display and revert back to the SELECT PROGRAM menu. If you do not want any start times-- Enter **0000**. 4 dashes (- - : - -) will appear indicating no start time is entered. All START TIMES are entered in as four digits. For example, a start at 8:30AM is entered as 0830, then press AM/PM button until AM appears.

Semi-Auto:

SEMI-AUTOMATIC

To use Semi-Automatic, at least one station within the selected program must be assigned under **STATION ASSIGNMENTS**, and have **WATERING DURATIONS** programmed in as well. Semi-Automatic "starts" are all independent. To put the Enercon+ in the semi-automatic mode, press **SEL** to select any of four programs **A** through **D**. Now press **ENT** to start the selected program. Any running program will be shown on the display when the rotary knob is set to the **RUN/STATUS** position. All stations assigned to the selected program will turn on sequentially– for one cycle only.

If a Semi-Auto program is currently running, you can not restart semi-auto again over the same program. A command to restart the same semi-auto program while it is already running will be canceled. You can however start other programs in Semi-Automatic.

If a Semi-Auto is started over a previously running automatic schedule of the *same program*, it will only cancel that program, and not affect any other programs concurrently running.

For example: if programs **A, B, C, & D** are currently running automatic schedules, and you activate Semi-Automatic program **A**, the Enercon+ will immediately cancel program **A**'s automatic schedule, and begin semi-automatic within program **A** only. Programs **B**, **C**, & **D** will remain unaffected and will continue with their automatic schedules. Up to four semi-auto programs can be activated at the same time.

Manual:

MANUAL START: Begin a manual start by pressing **SEL** to activate station entry. Key in the two digit station number (i.e. 04 for station 4), then press **SEL** to set running time in hours and minutes (i.e. 0012 for 12 minutes). Press **ENT** to begin manual start. To stop manual, press **ENT** again. Note that only one station at a time may be operated.

Rain & Station Delay Times:

RAIN DELAY: Press **SEL** to select **RAIN DELAY**, then press **ENT**. Now press **SEL** and key in the two digit number of days you wish the Enercon to delay automatic water scheduling then **ENT** to initiate the rain delay. At midnight of each day, the rain delay count is subtracted by one day. When the count reaches zero, automatic cycling resumes. The current day is considered the first day for rain delay. When in “Rain Delay” --Automatic, Semi-Automatic, and Test are inoperable, except for MANUAL start. STATION DELAY: Station delay sets the "dead" time in between valves used to help valves close and open without loosing main water line pressure. To set **STATION DELAY**, press **SEL** twice to select **STATION DELAY** then **ENT**. Now press **SEL** and key in the number of seconds (up to 99) you wish the Enercon to delay valve actuation, then press **ENT** to enter.

Stations Test:

The stations test sequentially runs through all assigned stations, on all programs, for a set amount of time. You can use this feature to maintain the irrigation system by observing valve operation while away from the Enercon controller. To use **STATIONS TEST**: press **SEL** and then **ENT**, then **SEL** again and enter in how long each valve will stay on --up to 99 minutes. Now press ENT. The first assigned valve in order will start, and the Enercon will remember this setting so that you will not have to enter it in every time you want to run the **STATIONS TEST**. If the bottom line on the display states: "[NO STATIONS ASSIGNED]" then you must program at least one station in the **STATION ASSIGNMENT** function setting.

Budgeting:

The Enercon+ has three water budgeting methods. The first is MANUAL BUDGET, and the second, MONTHLY BUDGET. Manual budgeting allows you to change watering times for all stations by percentage for all programs at once. Monthly budgeting works similarly, except with the ability to automatically change the percentage on a per month basis. When a new month is encountered, the budget will automatically readjust itself to the new settings. TEMPERATURE BUDGET is the third type of budgeting available, and is a patented method developed by Alex-Tronix. Watering durations are automatically increased or decreased daily, based on tracking the temperature of your locale. The result is more efficient water savings over other budgeting methods.

Note: The WATERING DURATIONS display will indicate the current budget setting and whether it is in MANUAL (**MA**), MONTHLY (**MO**), or TEMPERATURE (**TEMP**) budgeting.

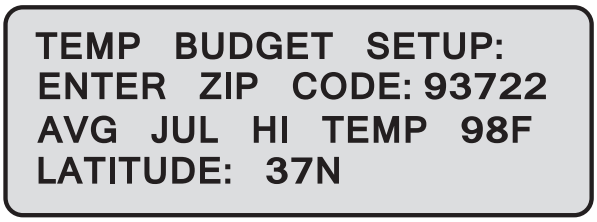
MANUAL BUDGET: To set **MANUAL BUDGET**, press **SEL**, then **ENT**. Press the **SEL** key again and enter in the percent you wish to change the budget to, then press **ENT**. You can increase watering duration by passing 100%. You can reduce watering duration by setting the budget less than 100%. Budgeting is adjustable from 1-399%, in 1% increments. Use 3 digits to enter the percentage desired i.e. 030 for 30%.

Example: Say **MANUAL BUDGET** is set at 100% (by default) and water duration was originally set at 00:10 (10 minutes). If you were to reprogram the **MANUAL BUDGET** to 200%, the duration would double and recalculate for 00:20 minutes. If it were changed to 50%, the new watering duration would be 00:05 minutes. Budgets are calculated to the nearest minute, with a 1 minute minimum. Baseline budgeting calculations are always assumed at the controllers default entry of MANUAL BUDGET at 100%. At least 1 station in **WATERING DURATIONS** must be entered before budgeting can be enabled or changed.

MONTHLY BUDGET: To set **MONTHLY BUDGET**, press **SEL**, twice, then **ENT**. Press **SEL** again. On the keypad, use the **RIGHT/LEFT** Arrow (**SEL** can be used as **RIGHT ARROW**) to move the cursor around the display. Place the cursor on each of the months and key in the budget percentages as a 3 digit number-- i.e. 30% is 030. When complete, press **ENT** to accept all monthly budget percentages.

TEMPERATURE BUDGET (**Mandated Setting for "Smart Watering"**): To set TEMPERATURE BUDGET, press SEL three times and press ENT. You will see the temperature budget screen prompting for the zip code of the controller's locale. Key in your 5 digit zip code and press **ENT**. If zip code is found in the Enercon's database, the bottom two lines will display average July temperature, and latitude of your controller's location. If the zip code entered does not exist, "DATA NOT AVAILABLE-CONTACT FACTORY" will be displayed. Press **SEL** to try again. OPTIONAL: If the peak summer temperature and latitude do not appear to be correct, these two parameters may be individually entered for better accuracy. Contact Alex-Tronix for to obtain the parameters, then press **SEL**, down to the PEAK SUMMER TEMPERATURE, and then LATITUDE; key in the parameters. It is important to note that when any of these two budgeting parameters are changed, an exclamation mark will appear next to the modified parameter showing that it differs from the controller's own data base. Press **ENT** to complete calibration. The Enercon Plus is now ready to calculate water budgeting via temperature. The temperature budget percentage varies hourly based on the previous 24 hour high temperature. (See Display C)

Display C - Temperature Budgeting Function Display



NOTE: While in the budgeting function, you can switch between budgeting modes anytime by pressing **SEL** to the mode, then **ENT**, pressing **SEL** again, then **ENT** again; the display then reverts back out to the main function display. You will notice which budget is active depending on where "(ON)" is next to. The remaining budgets that are not active retain their previous settings for future use.

Help/Info:

The HELP/INFO function provides information as well as the ability to adjust global configuration settings. Use **SEL** and ***NEXT** to scroll through information and functions. The following features are available from the **HELP/INFO** function:

- Alex-Tronix technical support telephone number.
- The firmware version of your own Enercon Plus controller.
- Valve Cycle Count -- The number of times the Enercon Plus has activated any station or other outputs.
- Enabling rain switch.
- Clearing program memory.
- Number of stations your Enercon Plus controller supports.
- Output board test (OBT).
- Minimum auto-start temperature setting.
- 24 hour high temperature (Maximum temperature of the day)

NOTE: The Enercon' upper main control board is used for all output board configurations, and can be configured to any number of stations as the output board allows by adding output modules. (up to 24--See options).

Rain Switch Enable:

If you are using a rain switch (Not Provided), you will need to activate this feature. Scroll down to **RAIN SWITCH=OFF**, and press **SEL** then **ENT** and **SEL** again to change the setting to yes (**Y**). You will see the display change from **OFF** to **ON**. The controller will now acknowledge any rain switch activity, and a rain drop icon will appear (switch opens) on the **RUN/STATUS** display when it rains. Only **MANUAL START** is available when the rain switch is active. Note that if the rain switch activates when the controller is in any other cycle, all valves will turn off.

Clear Memory:

WARNING: CLEAR MEMORY WILL ERASE ALL DATA IN THE CONTROLLER, except the output board configuration. You will need to re-program controller completely.

Output Board STNS:

The Output Board Stations setting allow you to configure how many stations your controller will have if you are adding output modules for more stations. It is preset from the factory-- based on the number of output modules supplied with the controller. If you add additional modules (more stations), you will need to reconfigure it here. Unless you are adding stations modules, you should normally never have to change this setting.

Note: The Enercon is originally configured to a specific number of stations ordered -- up to 24. For example, if a 12 station unit was ordered, and you were in the WATERING DURATION function, all 24 station watering durations are displayed, but only the first 12 can be programmed. You also cannot assign more stations or set watering durations past the configured number of stations.

Output Board Test (OBT):

The Enercon+ has a unique self-test feature known as the OBT. This differs from STATIONS TEST. The OBT allows you to troubleshoot the output board for proper operation using the test probe. This test should be performed before systemic troubleshooting is done in order to eliminate the controller as the source of the problem.

CAUTION: DISCONNECT ALL COMMON "C" WIRES ONLY (NOT STATION WIRES) FROM TERMINALS BEFORE PROCEEDING!

TEST PROBE: Locate the small orange colored connector on the top left of the output board with the words underneath: "**USE IRRIGATION WIRE AS TEST PROBE**". Cut a 2 foot piece of solid core irrigation wire, strip both ends ½", and insert one end into the small orange colored connector by pressing down the white colored arm against the board with your thumb or screwdriver.

Now that the test probe is ready, Turn the FUNCTION SELECTOR knob to **HELP/INFO** and press **SEL** to ***NEXT** and keep going until you reach "***OUTPUT BOARD TEST**". Now press **ENT**. You will need to have the wire probe ready and touching the "M" station. When prompted on the display, press the right arrow key (>), and within 3-8 seconds the Enercon+ will pulse the "M" station followed by the remaining stations in numeric order.

You will see the "green" L.E.D. light flash on latch followed by the "red" L.E.D. flash on release. Follow through the rest of the station outputs making sure you move the probe to the next station immediately after it releases (within 3 seconds), otherwise you will miss the event. Once the test has been completed, the output board test will stop and re-prompt you if you want to run the test again.

TEST RESULTS: If every station pulses "green", then "red" (latch and release), the controller is working properly. If there are "green" flashes and no "red" flashes, or vice versa, an output module or controller should be suspected.

MIN AUTO START TEMP

NOTE: Use of the minimum auto start temperature feature requires installation of temperature sensor. This feature inhibits automatic starts when the surrounding temperature around the probe falls below the entered set point. This feature can be used for freeze protection of lawn, plants and plumbing while irrigating in severely cold temperatures. The probe is read on the hour; the controller then decides to irrigate or not, depending on what the set point has been programmed to. If the surrounding temperature is at or below the set point, the controller will not automatically start. however; **MANUAL**, **TEST**, and **SEMI-AUTO** are not affected by this feature.

To set the minimum auto start temperature, scroll down to the last display, then press **SEL**, and **ENT**. Press **SEL** and select over to "**Y**". The display drops down to the numerical entry. The default setting is **OFF**. Key in the temperature at the point you would like the controller to stop irrigating. Press **ENT** to accept the set point and revert to ***NEXT**. The third line displays what the days high temperature was within the last 24 hours.

On the **RUN/STATUS** display, when minimum auto start is enabled, you will additionally notice the ambient temperature being displayed. When the ambient temperature falls to the set point where all automatic starts are disabled, a thermometer icon will also appear. When the ambient temperature rises above the set point, the thermometer icon will disappear, and automatic starts will resume. Note that any cycle(s) already in progress will be allowed to finish its schedule.

Controller On/Off:

To turn controller **ON** or **OFF**, press **SEL** to toggle between the two, then press **ENT**. "CONTROLLER IS OFF" will now be displayed, and is also indicated on the **RUN/STATUS** display. To turn the controller back on, press **SEL** twice again and **ENT**. On turn-off only, the Enercon+ will immediately initiate a solenoid release routine that will turn off any valves that are currently on. When the controller is in the **OFF** mode, pressing any button to "wake up the display" does not "Turn on" the controller. You must go to the **CONTROLLER ON/OFF** function to turn the controller back on. When controller is off, all functions are disabled, and the program can be reviewed.

GENERAL TROUBLESHOOTING:

Q1) **Is this a new system? If no move on to Q2; if yes then:**

a) **Are you using the BCS-SOL's?** This is an electronic module connected to our latching solenoid (LS). **YOU SHOULD NOT BE**....BCS-SOL's are only used for the BCS system. For all Enercon controllers, only *latching* type solenoids are used. Also do not use AC solenoids.

b) **Have you checked for shorts or opens on the outputs?** Using a digital multimeter... Do the following:

1) Set your multimeter to "ohms" (omega symbol, or upside down horseshoe)
2) With the field wires still connected to the terminal strip, put one probe on the common and the other on each station.
3) Read the multimeter in ohms ... You should read a resistance from 8 to 25 ohms depending on the solenoid manufacturer. If you are using the Alex-tronix LS solenoid provided by us, the resistance will be approximately 9 ohms per solenoid, not counting wire resistance. With 14 gauge wire, add 2.5 OHMS per 1000' of wire.

If any or all stations read "open" (infinite resistance), then you either have the wrong common wire selected or the field wiring is broken somewhere. You'll need to trouble-shoot your field wiring further in depth. You can also verify the controller and solenoid are working properly by removing the solenoid from the valve and wiring it directly on to the Enercon's output board. To do this, connect the black wire to a common and the red to any station. Operate it using the "Manual" function. If it operates there, there is a wiring problem.

c) **Are any of the latching solenoids wired in reverse?** All solenoid black wires must go to "C" (common) on controller terminals. Remaining red wires connect to each individual "Station" terminals. If valves do opposite of what is expected, the solenoids are wired in reverse. Note that when turning on a station, the solenoid latches and the plunger "snaps" into the body of the solenoid; turning off a station allows the solenoid to release and the plunger pops out.

d) **Does your valve require an adapter between the solenoid and valve?** Check the Alex-Tronix compatibility chart and see if you need an adapter or a extra O-ring to make our LS solenoid operate your valve. Adapters are readily available at Alex-Tronix. Do not mistake a valve adapter for a BCS-SOL module used on a different system.

e) **Is the RAIN SWITCH ENABLE on?** If you are not using a rain switch, the setting should be set to "OFF" under the "HELP/INFO" function menu. If you are using the rain switch, then the switch should be wired to the normally closed when dry (N.C.), and the setting should be set to "ON" under the HELP/INFO menu.

Q2) **System has been operating fine, but now not working.**

a) **Are the batteries run down?** The Enercon+ has the ability to let you know when the battery pack or the internal battery is low on the **RUN/STATUS** display.

If: "CHANGE BATTERIES" is displayed, the battery pack should be replaced, even though the controller may continue to operate- Remove battery pack and use Alternate Battery - (See Alternate battery).

If: "THIS PANEL NEEDS REPAIR" is displayed, the panel must be sent in for service due to depletion of the internal battery. When this happens, the controller will either be off or will be running its last cycle(s), and will not start again. The panel needs to be sent in for service.

b) **Main water line okay?** Check this by manually operating valve (at valve not controller). Loosening solenoid will achieve this. If main water pressured up okay-- Suspect valve.

c) **All valves not working? or some?** If any wires are suspected broken, run test Q1-B. You can also trade station wires with each other to see if the valve in question begins to operate. If so, send in controller/output board for service.

Q3) **The controller won't assign stations, durations, manual, etc. past a certain point.**

a) Check the **OUTPUT BOARD STS=XX** under the HELP/INFO menu. Is it set correctly?
b) Check to make sure your output board supports the number of stations you need as well.

Q4) **The controller has a problem reading temperature.**

a) If the display reads: **CHECK TEMPERATURE SENSOR** Check for an open wiring problem within the temperature wires of the RTS circuit.

b) If the controller reads 120F temperature and never changes or is obviously off from the ambient temperature, check for a short within the temperature probe wires.

Q5) **System worked fine, but now the solenoids latch but don't release.**

a) Replace master module (Yellow)

MAIN PANEL REPLACEMENT (CONTROL PANEL):

For service or upgrades follow the instructions below:

1) Open top door of pedestal and remove single hex/slotted screw on the right side of the front panel. Set this screw on top of the pedestal.

2) Open bottom door of pedestal, and remove battery pack connector.

3) Swing panel open, and observe gray colored ribbon connector plugged into the location marked- **TO OUTPUT BOARD**. Using your index finger and thumb slightly pull on one side of the connector, then the other end --back and forth until the connector is removed. DO NOT PULL ON RIBBON CABLE ITSELF! You may damage the harness and render the controller inoperable.

4) Remove the front panel by loosening the two hex/slotted screws on the left side (do not remove screws), and slide panel out.

5) Discharge your body from static electricity by placing your hand flat somewhere on pedestal chassis for a second or two.

6) Unpack the new panel from its static sensitive bag. **DO NOT TOUCH EXPOSED PINS WHERE CONNECTOR PLUGS IN**. Static from your body may damage unit.

7) Slide in the new panel between the screws and hinge and cinch down. Ensure the panel is aligned straight.

8) Match the key on the socket to the connector on the ribbon cable and firmly plug connector back into the socket.

9) Plug in battery pack connector on the output board.

10) Controller should be reset by pressing the reset button sandwiched between the rear and face plate of the main panel on the actual circuit board. An arrow marking (ENERCON) on the read panel is where the reset button is located.

11) Finally, fasten down main panel with remaining screw and then test unit by running the OBT or MANUAL start. Replace bottom door on pedestal. Reprogram watering schedules.

BATTERY REPLACEMENT:

INTERNAL BATTERIES: The Enercon+ uses two sets of batteries to operate. An internal battery powers the electronics and display, but not the solenoids. This battery is permanent, and was designed to last the life of the unit. Should this battery ever deplete, or there is a problem with the main panel, "THIS PANEL NEEDS SERVICE" will be displayed, and the panel must be returned to the factory.

BATTERY PACK: A separate user replaceable, lithium battery pack (part # BATT-PK ECN II) is standard included with all Enercon+ series controllers. This battery pack is *only used to power the solenoids*. About 40,000 valve actuations can be expected before depletion. Given an average irrigation schedule --the battery pack should last about 4 years, and may ordered through a distributor; it is user and field replaceable.

After a period of time, when the battery pack reaches depletion (all dependent on the number of valve actuations), the Enercon's display will remind you to replace the battery pack by displaying "CHANGE BATTERIES". If you see the warning appear and disappear at various times – Replace the battery pack.

BATTERY PACK REPLACEMENT: Remove the lower door exposing the output board, then unplug the battery pack connector located at the top-left area of the output board. Remove the pack from controller, and install a new one in reverse order. Removal of the battery pack does not affect program memory.

SERVICE BATTERY REPLACEMENT: On the output board, located is a plastic green cover with a 9V battery holder underneath. The holder can accommodate any 9 volt battery to supply temporary power as a work around in situations where irrigation cannot be interrupted, even if the depleted battery pack must be replaced. Up to 6 months of battery life can be expected using a 9 volt service battery. The service battery does not affect program memory. Remove the lower door exposing the output board. Press in the clip on the left side of the plastic green cover and swing out to the right to remove it, then unplug the battery pack connector and remove the pack from controller. Carefully snap into place a new 9 volt battery into the holder, and snap the cover back on to the output board.

CAUTION: DO NOT INSTALL A BATTERY PACK AND SERVICE BATTERY AT THE SAME TIME. THE SERVICE BATTERY WILL NOT FUNCTION AS A BACK-UP BATTERY.

IMPORTANT: After replacing the battery pack or 9V service battery, a manual start must be activated, then deactivated in order for the controller to measure the health of the newly installed battery; this action will clear the low battery warning. Not performing this action will allow the display to continue showing: "CHANGE BATTERIES" until the next automatic start.

VALVE COMPATIBILITY:

The Enercon+ can drive several types of latching solenoids; If using the Alex-Tronix LS solenoid, please review the valve compatibility chart enclosed to ensure solenoid-to-valve compatibility. Valve design and compatibility information is always changing-- If you do not see your valve on the chart, or have other questions, please contact our factory for further instruction. Please have the following information on hand before contacting our factory:

- Controller model number.
- Valve brand, model number, size, etc.
- Solenoid brand.

OPTIONAL FEATURES:

Lightning Suppressor Option --Though the Enercon is isolated from AC power lines, helping to reduce the risk of power surges from lightning storms, an output board with lightning suppression gas tubes should be used in an areas susceptible to lightning. Contact factory for this option.

CARE AND MAINTENANCE:

The Enercon+ does not require in depth maintenance; however an annual check of following is good practice to ensure system reliability:

- Lubricating locks -- Open door, spray silicone lubricant annually. Do not spray into controller.
- Wire connections -- Check all connections on output board and solenoids.
- Stations Test -- Run STATIONS TEST to verify all valves are operating.
- Cleaning solvents -- Do not use caustic solutions on the Enercon Plus pedestal chassis.
- Cleanliness -- Internally clean spider webs, insects, dirt, mineral deposits, rust, etc.

SPECIFICATIONS:

Pedestal dimensions and info:
Height:35.5" (90.2cm) Width:7.5" (19cm) Depth: 5.25"(13.3cm). Weight: 24lbs

Battery life:
3.68V -approximately 10 years, permanent; Standard Battery Pack - Approx. 40,000 actuations.

Stations:
Up-gradable output board with increments of 4 stations per module, up to 24 stations (6 modules).

Max. conduit size pedestal can accept:
One 2", or two 1-1/2" pipes.

USER NOTES:

Warranty

Upon purchase, users of this product agree to the following terms, conditions and limitations of warranty and liability coverage:

Alex-Tronix warrants the Enercon including batteries to be free from original defects for two years from the date of original sale. The manufacturer shall replace, free of charge any part found defective under normal use and service within the guarantee period, provided the product is installed, used and maintained in accordance with any applicable instructions or limitations issued by Alex-Tronix.

Components supplied as replacement parts are warranted for 90 days from the date of shipment. The manufacturer assumes no liability for incidental or consequential damage sustained in the adoption or use of our engineering data, service or products.

Liability is therefore limited to the repair of the product manufactured by Alex-Tronix. No agent or representative has the authority to waive or add to this agreement.

Altered products, damage due to controller doors left open or unlocked, or use of products in a manner not intended shall void this warranty.

For warranty service, ship unit prepaid to the address below. Controllers damaged in transit due to improper packaging are not covered by warranty.

ALEX-TRONIX

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