Alex-Tronix
FILTER MASTER SERIES

FM-4/8 Filter Backwash Controller Operation Manual

IMPORTANT: Prior to use, please read manual in order to avoid system damage.

REV. 041318

FM-4/8 Operation Manual

Thank you for purchasing the Alex-Tronix FM-4/8 filter controller-- manufactured in the U.S.A. The FM-4/8 is our latest accommodating our digital differential pressure gauge ('SPD' included), yet compatible to the Murphy switch gauge. Additionally, the FM-4/8 features 'progressive backwashing' which allows every new cycle to start cleaning a different tank for better backwashing performance. Finally, the FM-4/8 features an external start input for remote backwash initiation, making it easy for PLC control.

INSTALLATION:

The FM-4/8's enclosure meets or exceeds NEMA 4X IP66 specifications. There are a few ways to install the enclosure, and must be done prior to wiring.

After unpacking, place the unit face down on a soft surface, and choose one of two mounting styles from the pictorial below. You can use 4 tabs 'E' or two braces 'F' as the enclosure's mounting support mechanism. See Fig. 1 below:

Ensure the unit's mount is level, and test by opening the enclosure's door by turning both catch lock knobs 90 degrees, then unsnap both catches, and swing the door open. Ensure the door opens and closes freely with no obstructions.

Using a phillips screwdriver, remove the two screws on the right side of the front panel, then swing out the front panel. The wiring terminal is now exposed, and is ready for wiring.

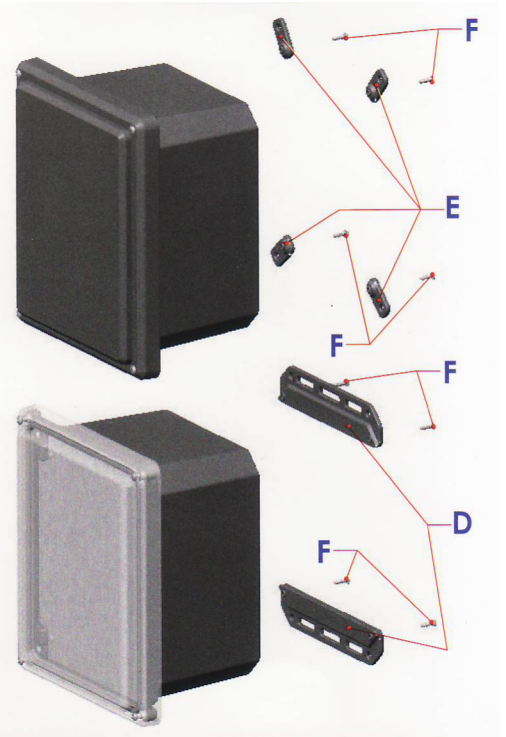


Fig. 1

Output selector: On the rear of the main panel circuit board (bottom right), set the solenoid output selector switch to match the solenoid type you have– Compatible to: 24VAC (left position) or 12VDC or 12VDC Latching (right position).

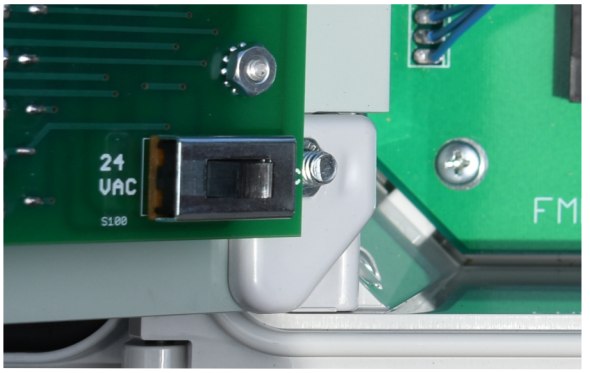


Fig. 2

FIG. 3 POWER WIRING CONFIGURATION OPTIONS

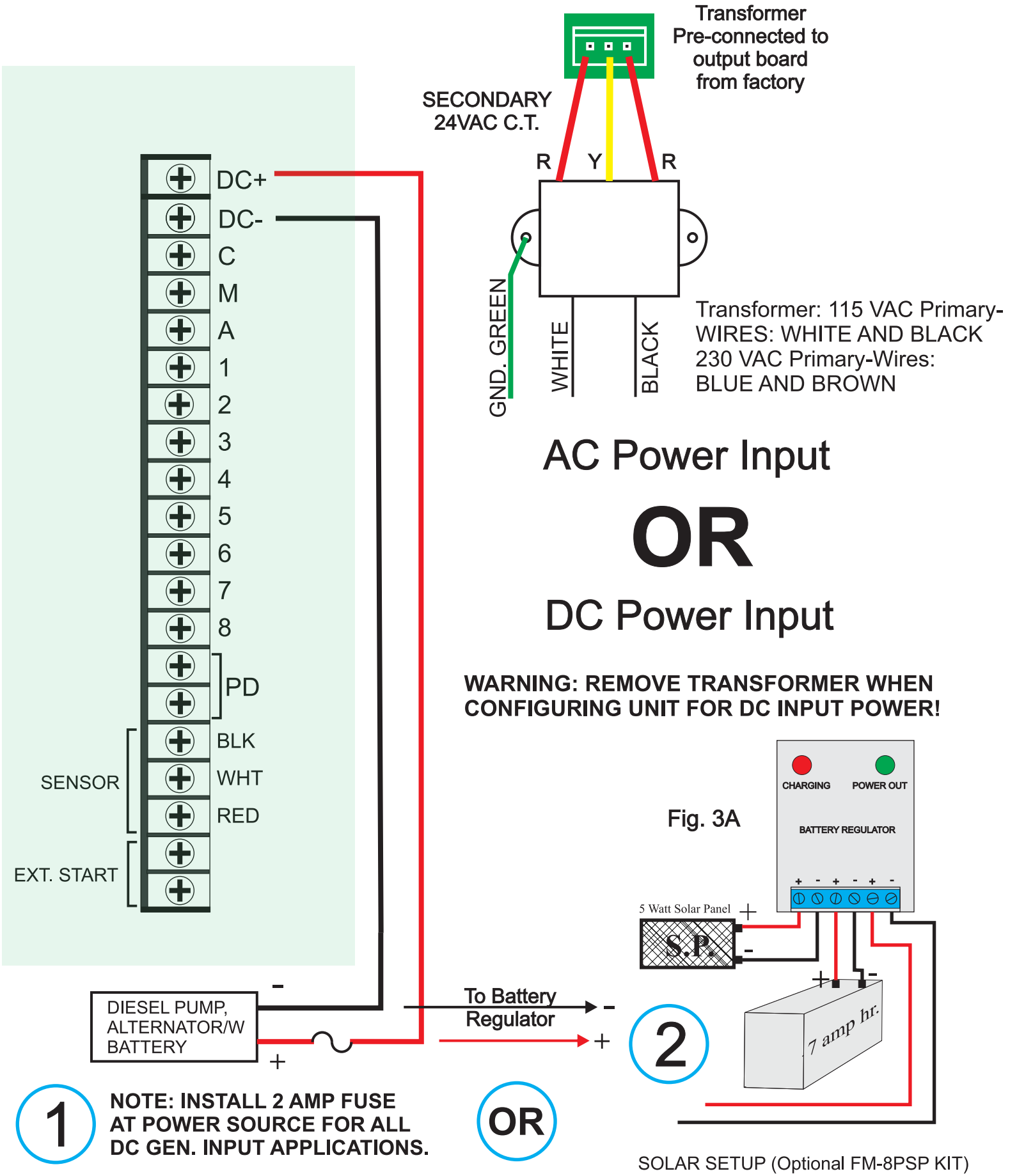


Fig. 3A

SOLAR SETUP (Optional FM-8PSP KIT)

Fig. 4 - Solenoid Wiring

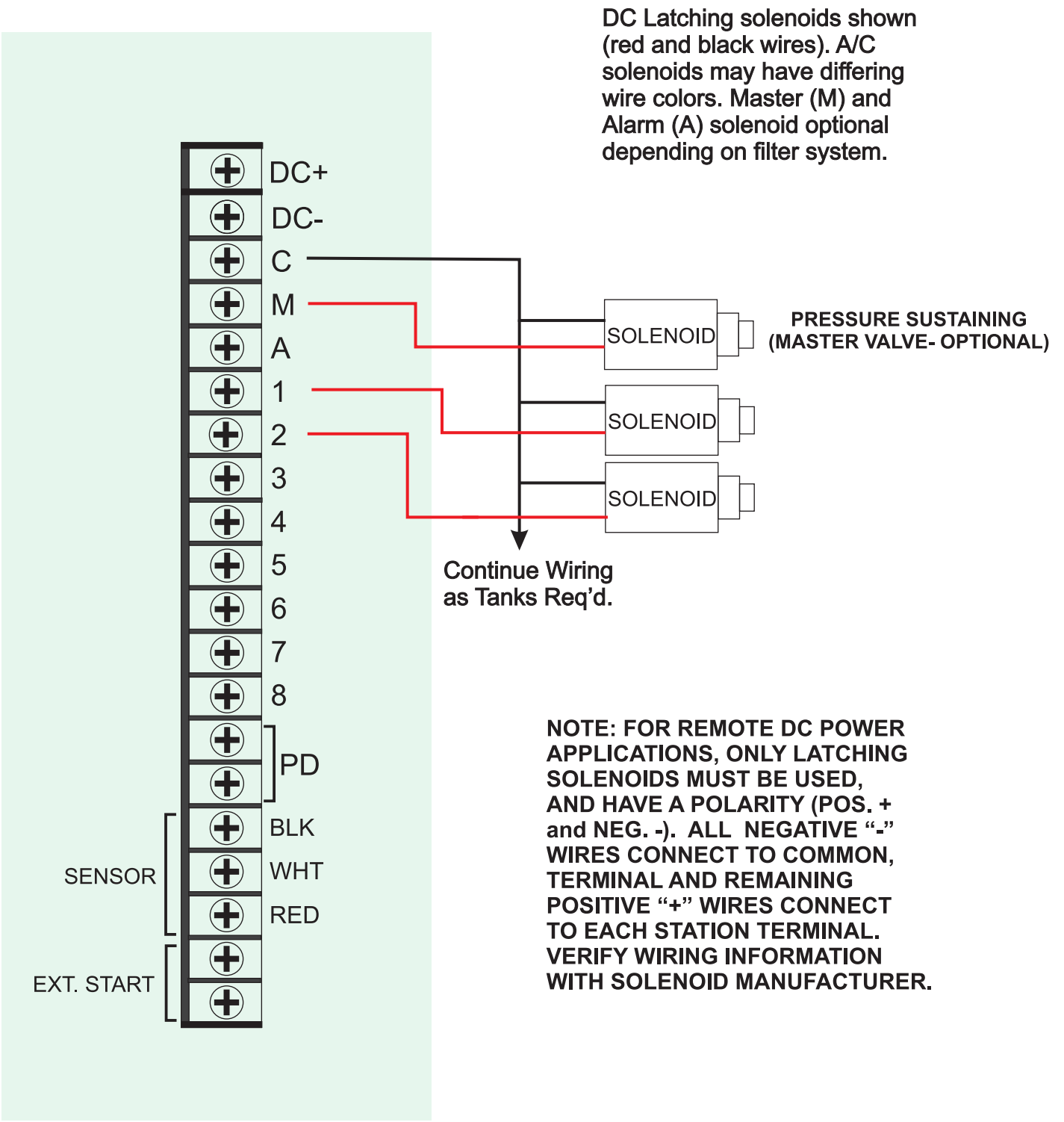
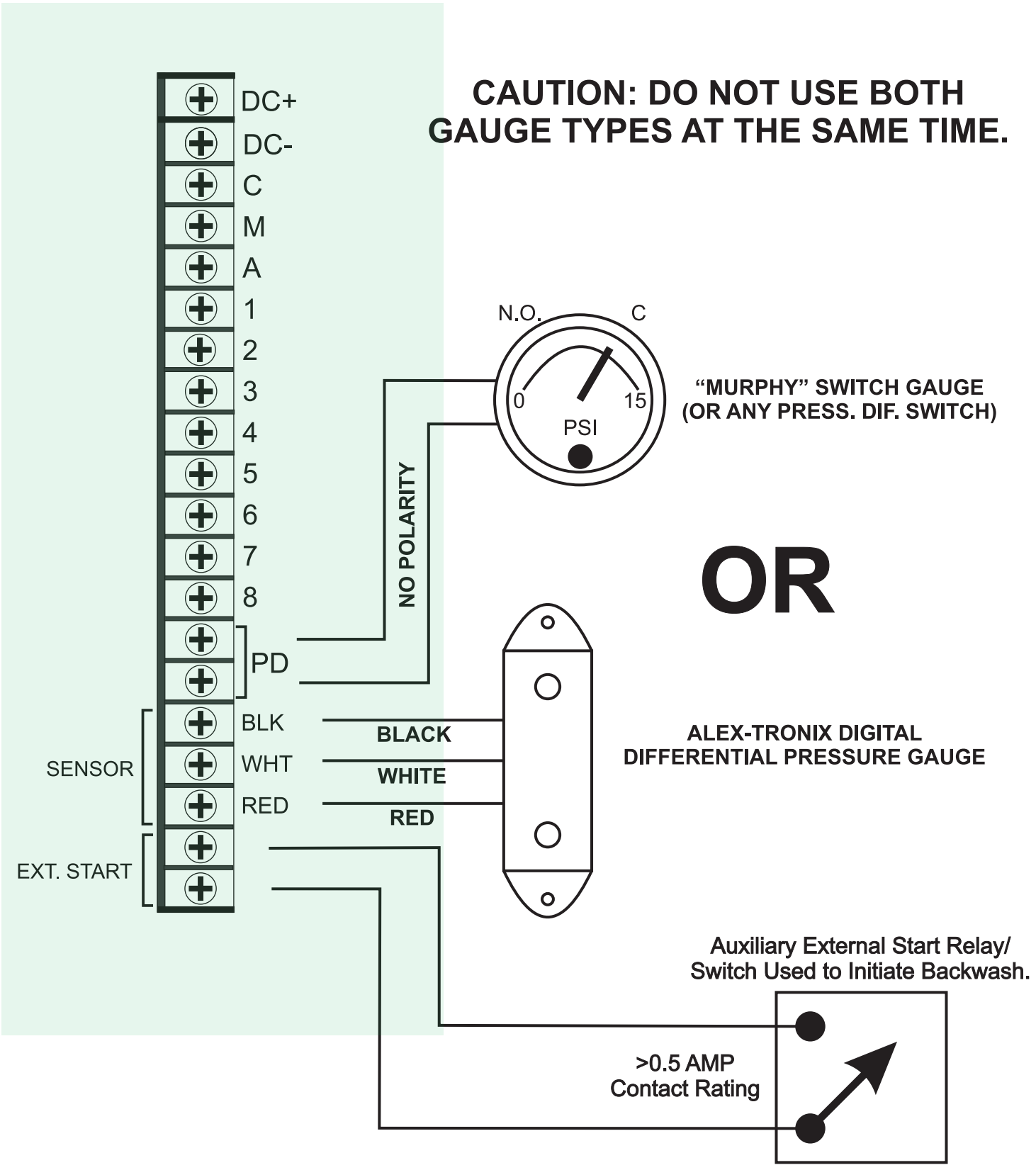


Fig. 5 Sensor or Gauge Wiring



Pressure Differential Gauge: Depending on the gauge type you have– Murphy Switch Gauge or the Alex-Tronix digital gauge (SPD), locate a mounting area either on the filter manifold, or the FM-4/8's enclosure itself (mounting bracket required for Murphy). You may require extra color coded (22-18 AWG) wire to reach controller terminals.

WIRING: (Refer to Figures 3-5)

NOTE: Wiring must be performed by a certified electrician, and done in a manner to adhere to all local electrical and or building codes. Incorrect wiring may damage unit, and makes the unit exempt from factory warranty coverage. Safety is first priority.

INPUT VOLTAGE WIRING:

The FM-4/8 accommodates a single phase input voltage of: 120VAC or 12VDC. 220VAC operation is also possible with a specially ordered transformer from the factory.

DO NOT CONNECT BOTH THE TRANSFORMER AND DC POWER AT THE SAME TIME.

A/C input: For 120VAC input, connect both black primary transformer wires to the **HOT** and **NEUTRAL** wires from the circuit breaker box; primary transformer wires have no polarity. Next, connect the safety ground (**green** wire-- attached to transformer case) to the ground wire returning to the circuit breaker box's ground terminal. This safety ground is required by NEC code. The transformer's secondary wires are pre-connected from the factory. Set output switch (on rear of panel) to AC or DC as previously discussed. NOTE: Setting the output switch to DC when using a transformer is only used for DC non-latching solenoids.

DC input from alternator: For DC operation, remove the A/C transformer, and directly wire DC power into the first top two terminals on the terminal strip marked: + and -. An external in-line fuse with a rating of 2 amps (purchased separately) must be installed on the positive terminal located at the battery. To ensure power quality, directly connect the wires to the battery terminals. If the power source is noisy, install an inline noise filter (purchased separately). Use quality terminal connectors at the battery- Do not use jumper clamps of any kind. Optimum operating voltage is 12.8-13.8 volts. Set output switch (on rear of panel) to DC. NOTE: Though latching solenoids can be used with this input configuration, non-latching solenoids for this configuration is highly recommended.

DC input from solar setup: For solar/battery powered operation, the FM-4/8S kit is required (optional). The kit includes a plastic enclosure which houses a 7 amp hour battery, and includes a solar panel, mounting hardware, battery charge regulator, and hook-up wire. Mounting provisions need to be made for the kit in addition to the FM-4/8 controller. Solar set-ups can only be used with latching solenoids.

☑ Begin by mounting the solar kit within a few feet of the controller. 5 Feet of wire is provided. Ensure chassis is level, securely attached, and that the maximum amount of sunlight exposure strikes the top surface of the chassis through most of the day.

☑ Remove the A/C transformer and retain for future use, then directly connect its DC power '+' and '-' terminals through the bottom of the controller box and in through the bottom of battery enclosure with the wire included in the kit. Connect to regulator's ***output terminals*** *noting polarity* (Refer to Fig. 3).

☑ Referring to the solar panel, insert the wires through the mounting bracket, and fasten the solar panel bracket to the panel using the provided hardware. Now insert the assembly's wires through the top mounting hub on the chassis box. Fasten the bracket by screwing the assembly into the hub on the top of the chassis. Once again, referring to Fig 3, connect the solar panel wires to the regulator's

input terminals *noting polarity*.

☑ Finally, connect the battery wires to the regulator first (battery icon imprinted on regulator). These two terminals are centered. Note polarity. Turn controller power to 'OFF', verify there are no shorted wires, then connect the regulator to the battery. The controller may now be powered up. If it does not turn on, check wiring, followed by battery itself. 12.6VDC is a healthy battery.

☑ Align the solar panel by turning in manner to optimize full view of the sun throughout the day, typically facing south.

Use the battery (7 amp hour rechargeable) and solar panel option we provide for optimum performance. If a non specified battery is used with an underrated solar panel, the battery will eventually become weak, and erratic operation of the controller will result. This could occur after several weeks of normal operation. Manually charging a large car battery on and off every several weeks, and re-connecting it to the controller is not recommended, and may lead to damage of the filter system. Optimum operating voltage is 12.8-13.8 volts. Set output switch (on rear of panel) to DC. Latching mode is configured from the front panel.

OUTPUT BOARD:

POWER CONNECTOR: The FM-4/8 has two terminals for DC input and a separate 3 pin connector for the transformer and is factory pre-wired. See Fig. 2

MASTER OUTPUT: This special output is used to *turn off* a field's main water valve in order to maintain sufficient pressure within the filter system for adequate backwashing. This output remains active throughout the backwash cycle and deactivates when the controller moves back to filtering mode. The output voltage corresponds to what the tank outputs are set to -- i.e. A/C or DC or DCL.

ALARM OUTPUT: This output terminal works in accordance with the status of P.D. Gauge/Sensor, and activates when immediate, and consecutive backwashes occur. In other words, when the P.D. still remains triggered after a backwash cycle (indicating the filter system was not properly cleaned), the output will activate on the fourth backwash start cycle. When activation has occurred, "**P.D. ALARM PRESS + TO RESET**" is displayed. Press the "**+**" pushbutton, and the alarm output will reset, and the display clears. It will be important to know why the alarm has activated, so a filter system diagnostic should be performed to prevent any possible damage to the filter(s) themselves. This terminal may be used to drive a small lamp, alarm bell, PLC, etc., via relay. The output voltage is set according to what the tank outputs are set to -- i.e. A/C or DC or DCL.

STATION OUTPUTS: For A/C or DC non-latching solenoids, one wire from each solenoid all are connected to "C" (common) terminal. The remaining wires from each solenoid connect to station terminals 1-8 including "M" (master) valve if used. For latching solenoids, the same wiring scheme is followed, except note that latching solenoids *have a polarity*; all negative "-" wires are connected to the "C" terminal; the remaining positive "+" wires are connected to the station terminals, including the "M" terminal. Refer to Fig. 3 for wiring details.

PRESSURE DIFFERENTIAL GAUGE/SENSOR: This unit can function using two types of P.D. gauges -the traditional Murphy switch gauge (optional), and the new Alex-Tronix digital sensor 'SPD' (included). For the Murphy gauge, connect the N.O. and C on the gauge to the FM-4/8 terminals both marked: "P.D.". These two connections have no polarity.

For the digital sensor, match color and connect the wires to the three terminals: Black to "B", White to "W", and Red to "R" --noted under 'SENSOR' on the terminal strip. Refer to Fig. 3 for wiring details.

DO NOT WIRE BOTH THE SENSOR AND GAUGE AT THE SAME TIME.

EXTERNAL START: The FM-4/8 has two terminals located at the bottom of the terminal strip marked

"EXT. START". These are "dry contact" control inputs, so no power is applied to these terminals. Shorting the two contact terminals can remotely initiate a backwash start irrelevant of where the function selector is positioned, and can also be repetitively triggered to move forward to the next tank. External start can be initiated by switch, or a PLC controlled relay. A minimum time of at least 100mS of switch closure is required to initiate a backwash. If the contacts remain closed, any further control actuations cease, and the unit will not respond. The contacts must open for at least ½ of a second and then close to move forward in backwashing the next tank. An external programmable logic controller (PLC) may be programmed to repetitively open and close the contacts to move to a specific station. A 0.5A switch/relay contact rating or higher is recommended. See Fig. 5 for wiring details.

CONTROLS:

Power: Use this switch to turn controller on or off. When power is removed from the unit by any means, all programmed settings are retained in flash memory. The FM-4/8 always resumes operation at the point where the controller was turned off, when later powered back on. There is no "real time clock" in the controller.

Function Selector Knob: Use this knob to select which function you wish to view or program. There is no specific setting this knob must be set to for normal operation, and will normally operate as long as the FM-4/8 is correctly programmed.

Select: This pushbutton selects what part of the function you will program. The cursor blinks when selected.

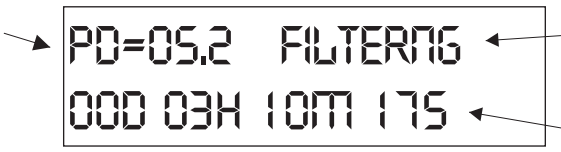
+ and - : These two pushbuttons allow you to edit any parameters within a function.

Enter/Manual Start: Pressing this pushbutton sets the parameters desired. You must press **'ENTER'** after changing any parameters when programming the unit. Once programmed, if desired, you can manually initiate a backwash when the function knob is on the "STATUS" position.

PROGRAMMING (FUNCTIONS):

STATUS: This function displays what mode the controller is in. Typical modes can include: Filtering, re-dwell, Tank Backwashing Number, and Dwell. Unit shown in filtering mode below:

SENSOR DIFF. PRESSURE



STATUS

DAYS, HOURS, MINUTES SECONDS, Since Last backwash.

P.D. DIFFERENTIAL SETTING: Use this setting to set the trigger point for the sensor gauge based on the SENSOR/GAUGE TYPE function. If the function is set for *"P.D. GAUGE"* then this display will show: *"SET DIFFERENTIAL SI ON GAUGE"* and no adjustable parameter is available. If the SENSOR/GAUGE TYPE function is set for *"SENSOR"*, then a differential trigger setting will be available for adjustment. Press SELECT, +, and - to set the backwash trigger point of the sensor. 7

OR

PSI is the default setting if programmed for 'SENSOR'. Press ENTER when finished.

RE-DWELL TIME: This is a delay time used to build system pressure in orchestration with the pressure sustaining master valve, in order to ensure valves open and close on systems with smaller pumps. Press SELECT, +, and - to set the delay time (up to 255 seconds) before the unit goes into backwash mode.

BACKWASH TIME: This sets the cleaning duration for each filter tank. Press SELECT, +, and - to set the delay time (up to 255 seconds) per tank. Press ENTER when finished. If the unit has no backwash time programmed, NO BACKWASH TIME is displayed.

DWELL TIME: This sets idling time between tank backwashes in order to maintain system pressure, and allow valves enough time for valves to open and close as backwashing progresses. Press SELECT, +, and - to set the delay time (up to 99 seconds). Press ENTER when finished.

PERIODIC TIME: This sets backwashing *cycle intervals*. It is independent from the P.D. gauge initiation; however, if the gauge triggers a backwash cycle before a periodic interval initiates one, the periodic's internal time clock will reset to zero when a backwash starts, and begins timing up again. After a cycle is complete, the controller reverts back into filtering mode, the periodic time resets to zero, and periodic timing begins again. **NOTE: If the set periodic time is less than the total backwash cycle time, the controller will continuously start another backwash (loops).**

P.D. DELAY TIME: Intermittent surge pressure in a filter system can trigger the controller which could cause 'nuisance triggering' of a backwash cycle unnecessarily. Adding P.D. delay time alleviates unnecessary backwashing, and allows 'gauge bouncing' to stabilize before a legitimate pressure reading is taken. Press SELECT, +, and - to set the delay time (up to 255 seconds). Contact filter manufacturer for recommended settings.

TANK ASSIGN: Depending on how many filter tanks there are, you can activate/deactivate any of them --up to eight. Press select, and move along to each tank number, then use "+" or "-" to activate or deactivate that tank; when finished, press enter. If all tanks have been unassigned, "TANKS UNASSIGNED" will be shown on the display. By default, all tanks are assigned on.

BACKWASH TANK SEQUENCE: There are two orders for backwashing --*Sequential* and *Progressive. Sequential* backwashing traditionally starts with Tank 1, 2 ...8 *in order* every time a new cycle starts. *Progressive* backwashing starts by cleaning (rotates) a *different tank* every time a new cycle starts i.e. 1,2,3,4...8 then 2-8,1 then 3...8,1,2, etc, etc. This can be used to help all tanks clean evenly and keep water flow consistent through all tanks while filtering.

BACKWASH CYCLE COUNT: This function displays how many backwashes have occurred since it was last cleared. To reset the count to zero, press select, then select over to 'Y', and ENTER/MANUAL START push button.

SOLENOID TYPE: The FM-4/8 is compatible to 24VAC, 12VDC non-latching, and 12VDC latching solenoids. Default solenoid setting is 'NON-LATCHING' mode. To change to Latching mode (12VDC input only), press select twice, and press enter. You must also set the output switch (located on rear panel) to the correct configuration. Referring to earlier discussion, your options are as follows: For 120/240VAC power supply input, the output switch can be set for AC or DC. For 12VDC power supply input, whether from a DC generator or solar panel set up, set the output switch to DC.

SENSOR/GAUGE TYPE: If you will using the traditional 'Murphy switch gauge' choose **GAUGE**. If using the Alex-Tronix sensor, choose **SENSOR** and press the ENTER/MANUAL START push button.

OPERATING CHARACTERISTICS

NOTE: **It is important to always have backwash time and a tank assignments properly set, otherwise system damage may result.** The FM-4/8 initiates a backwash cycle by: Manual start, differential pressure, and/or periodic time. When backwashing initiates, the FM-4/8 moves out of filtering mode, and individually cleans each tank. The filter system's differential pressure drops when a cycle is complete, and the tanks are deemed washed. If the pressure does not drop after a backwash cycle, troubleshooting of the filter system itself should be performed, beginning with solenoid and valve maintenance. Additional troubleshooting resources on controls can be sought out on the tech support page on the web at: www.alextronix.com. Contact the manufacturer for filter system maintenance or service.

FUSE WARNING: Should the output fuse ever blow, a red LED on the front panel next to the output fuse will illuminate. This fuse is located on the front panel. The following symptoms should be examined before replacing the fuse:

- Solenoids defective or become defective when heated for long periods.
- Primary voltage too high.
- Short circuit in solenoid wiring.
- If a newly installed system is in place, incorrect wiring should be considered.
- Power surge damage.

The display will clear the fault, after the short circuit is resolved, fuse is replaced, and a backwash cycle is initiated.

CAUTION: Replace fuse with same type only! – 3A ATO (automotive fuse.)

A spare fuse is provided within the enclosure.

For any questions or help regarding this controller please contact us at 1-888-224-7630.
For questions regarding you filter system, contact the manufacturer.

WARRANTY

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

Alex-Tronix warrants the FM-4/8 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 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 of Alex-Tronix has the authority to waive or add to this agreement. Altered products, or use of products in a manner not intended shall void this warranty. For warranty service, ship unit pre-paid to the address below. Controllers damaged in transit due to improper packaging are not covered by warranty.

For warranty repair, send defective product freight pre-paid to:

Alex-Tronix Controls Div. GNA Industries - 4761 W. Jacquelyn Ave. Fresno, CA. 93722 - Tel: (888)-224-7630 Fax: (559) 276-2890
www.alextronix.com - orders@alextronix.com