Alternating Relays

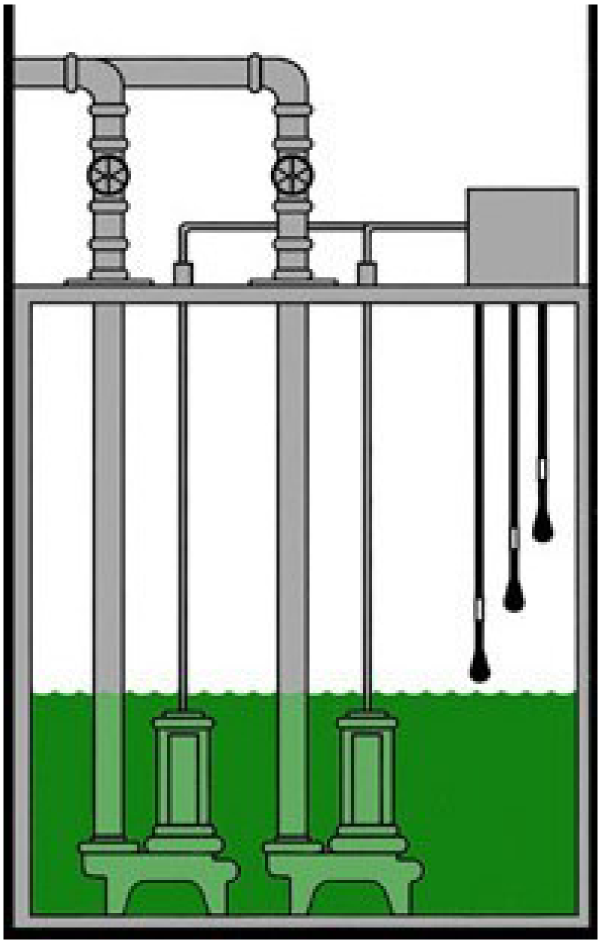
ARA-XXX-ABA 2 Pump, 1 Switch Operation

ARA-XXX-ABA 2 Pump, 2 Switch Operation

ARA-XXX-ACA-ADA-AEA 2 Pump, 3 Switch Operation

ARA-XXX-AFE, Triplexor 3 Pump, 4 Switch Operation

ARA-XXX-AGE, Quadraplexor 4 Pump, 5 Switch Operation



ATC Alternating Relays are used to assure equal run time on pumps, motors, and compressors. They also allow for the addition of more capacity in the event of excess flow requirements.

Some of the most common and frequently asked questions about the ARA/ ARB Series Duplexors are answered:

All models are available with control voltages of 24, 120, and 240 VAC ±10%, 50/60 Hz. The 240 VAC Models are not recommended for use in installations where the control voltage would be below 216 VAC. Consult the factory for price and delivery on 208 VAC applications.

The 24 and 120 VAC models carry UL 508 Recognition (File E55826) and CSA C22.2 Certification (File LR40123). The 240 VAC models are not CSA.

Control voltage must be maintained continuously for proper operation. Loss of voltage will result in the return of the relay to quiescent state.

Unlike an Impulse Relay, the Alternator sequences or "toggles" positions upon the opening of the control switch input. If position change took place on control voltage application or control switch closure, the last load engaged would "bump" on at the beginning of each pumping cycle.

LEDs indicate the position of the output and glow when the control switch is closed. In the quiescent state (illustrated by silk-screened enclosure diagrams) the Position #1 LED is lit. In the energized state, the Position #1 LED is extinguished and the Position #2 LED is lit.

The ARA Series are Standard Alternators providing automatic alternate sequencing. The ARB Series have the automatic sequencing feature plus the option of locking out the automatic sequencing so that lead load may be maintained as desired. A three position switch permits field selection of standard duplexing or maintaining #1 or #2 as the lead position.

Solid State switches are not recommended for control switch inputs because of their "off state" leakage, which can result in improper sequencing. Some Solid State switch outputs can be "swamped" with parallel resistance to alleviate this problem. It is recommended that the factory be consulted.

The "B", SPDT and "D", DPDT wiring configurations are truly "dry" contact arrangements with no internal connections between them and the control voltage. The "C" and "E", DPDT cross wired configurations have pin #1 movable common with the control voltage when the control switch is closed.

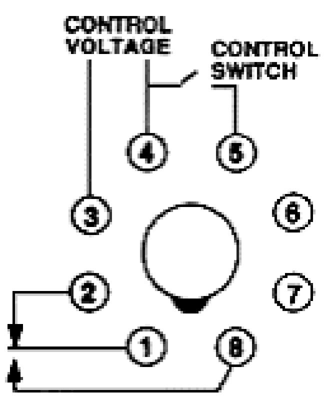
All of the illustrations further described in this bulletin deal with a liquid rise and fall in pumping applications. Duplexors can just as easily be used with the rise and fall of pressure in compressor applications or with temperature controls in Air Conditioning/Refrigeration applications.

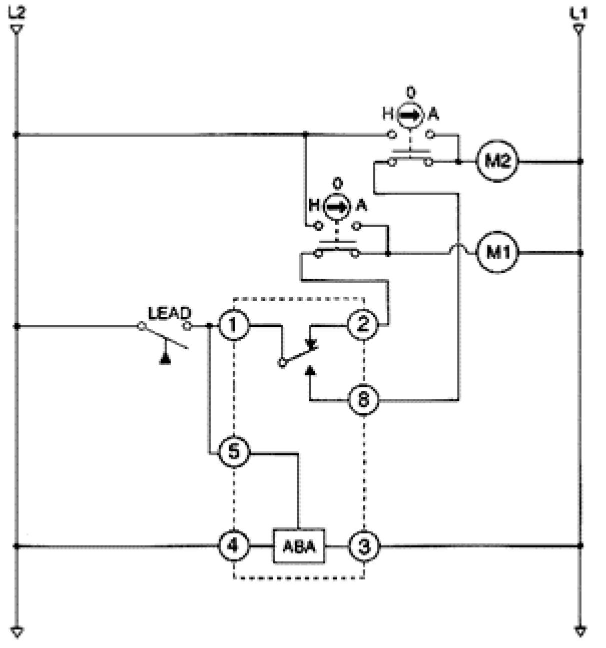
2 PUMP ARA-XXX-ABA, 1 SWITCH OPERATION

This model is a SPDT, 8 pin octal plug- in.

As with all ATC Diversified Alternating Relay models, the internal relay "toggles" or changes states each time the control switch input opens.

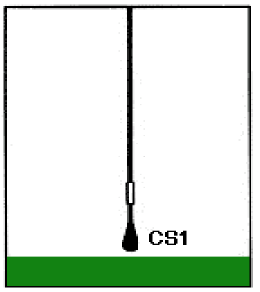
B-SPDT





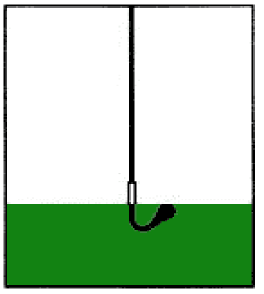
STEP 1

This example illustrates the normal operation of the alternator in a pump down application with one normally-open-dry float switch. The switch is numbered CS1 and designated as the lead switch. The example begins with the switch open and both loads de-energized.



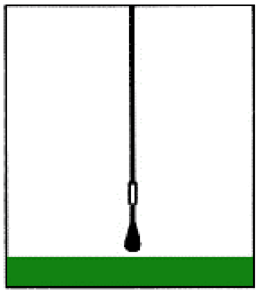
STEP 2

As the fluid level rises, CS1 closes and load M1 energizes.



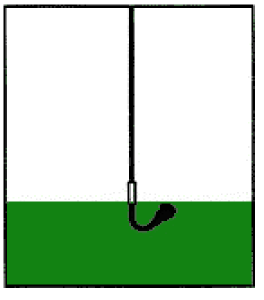
STEP 3

When the fluid level falls and CS1 opens*, load M1 de-energizes and the alternator toggles to position 2.



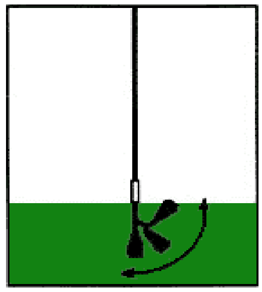
STEP 4

As the fluid level rises, CS1 closes and load M2 energizes. When the fluid level falls and CS1 opens, load M2 de-energizes, the alternator toggles to position 1, and steps 1-4 will be repeated.



STEP 5

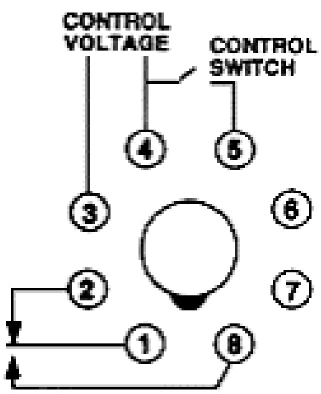
In a single switch application backwash could cause the float to bounce which would result in unwanted toggling and load start-up. Provisions should be made to incorporate a wide differential switch to avoid this condition.

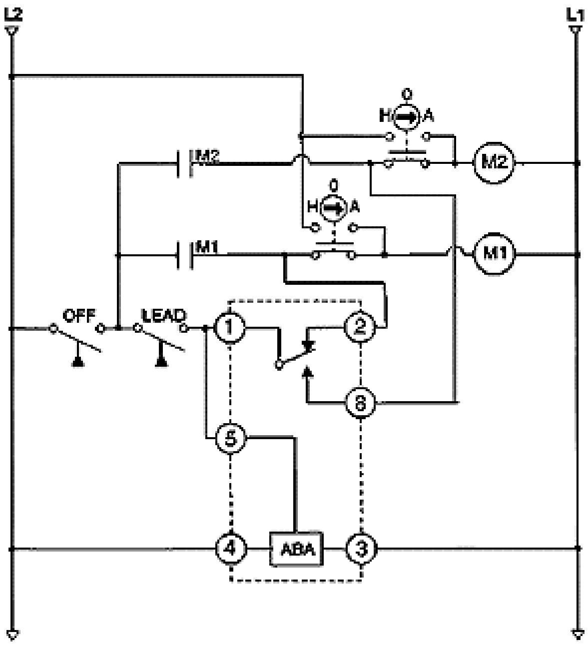


ARA-XXX-ABA 2 PUMP, 2 SWITCH OPERATION

To alleviate any "bounce" condition caused by rapid changes in the fluid level, it is suggested to use latching contact, dual switch inputs as shown in step 1, Now a wide differential between start-up and shut-down can be maintained.

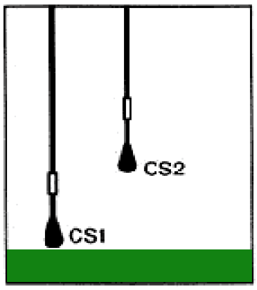
B-SPDT





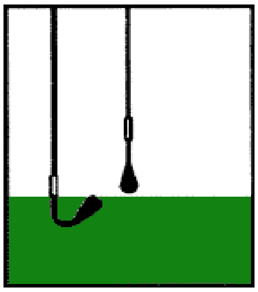
STEP 1

This example illustrates the normal operation of the alternator in a pump down application with two normally-open-dry float switches. The switches are numbered CS1 and CS2 and designated off and lead. The example begins with switches open and both loads de- energized.



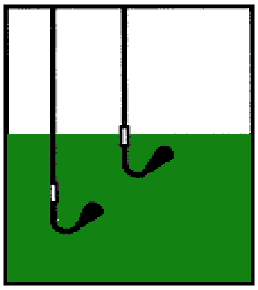
STEP 2

As the fluid level rises, CS1 closes. Neither load energizes.



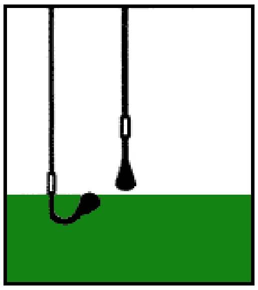
STEP 3

If the fluid level continues to rise, CS2 closes and load M1 remains energized through the auxiliary M1 contacts.



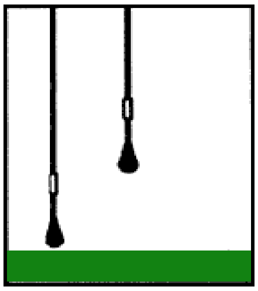
STEP 4

As the fluid level falls and CS2 opens, load M1 remains through the auxiliary M1 contacts, energized.



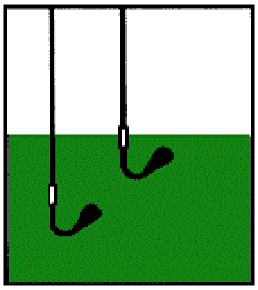
STEP 5

When the fluid level is pumped below CS1, M1 load and auxiliary contacts de-energize and the alternator toggles to position 2.



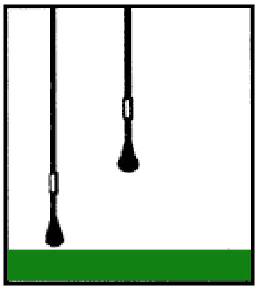
STEP 6

As the fluid level rises to close CS1 and CS2, load M2 energizes and remains energized until the level is pumped below CS1.



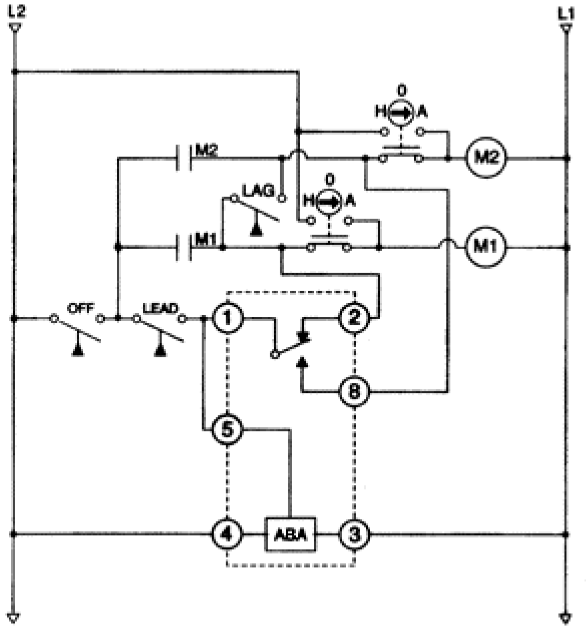
STEP 7

The subsequent openings of CS1 causes load M2 to de-energize and the alternator to toggle to position 1, and steps 1-7 will be repeated.

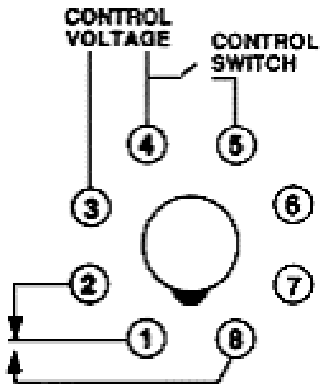


ARA-XXX-ABA 2 PUMP, 3 SWITCH OPERATION

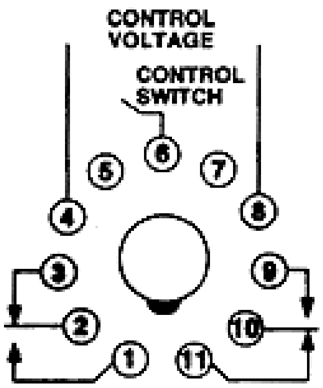
To alleviate any "bounce" condition caused by rapid changes in the fluid level, it is suggested to use latching contact, dual switch inputs as shown in step 1, Now a wide differential between start-up and shut-down can be maintained.



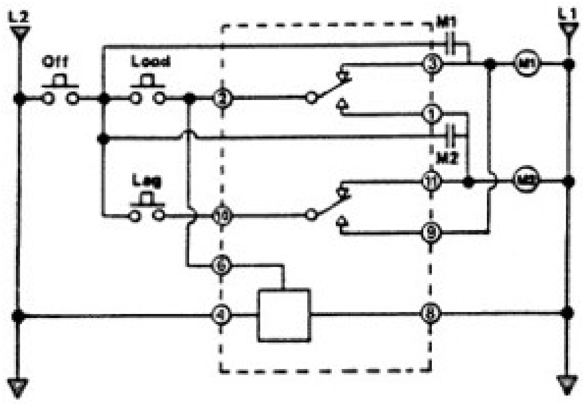
B-SPDT



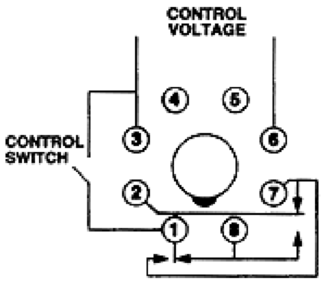
D-DPDT



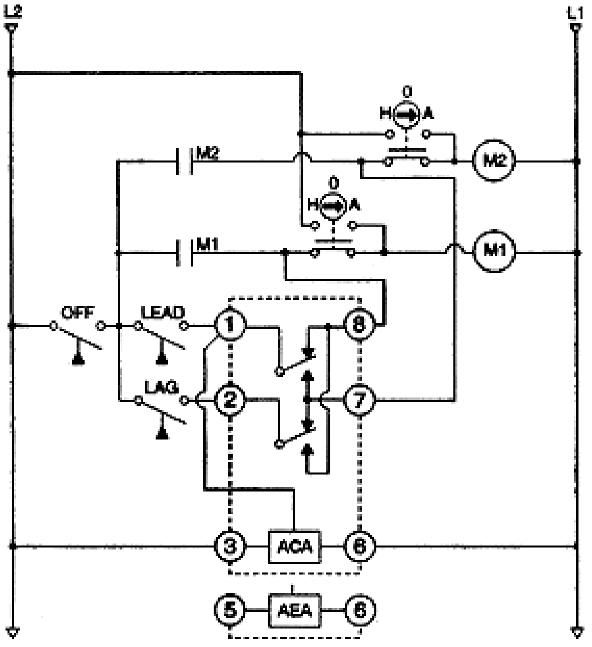
ARA-XXX-ADA



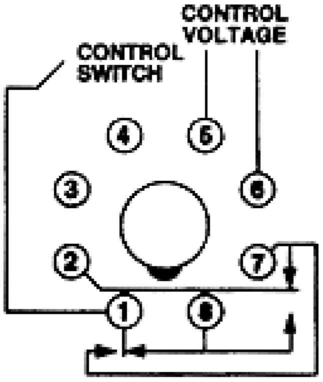
C-DPDT (cross wired)



ARA-XXX-ACA, -AEA

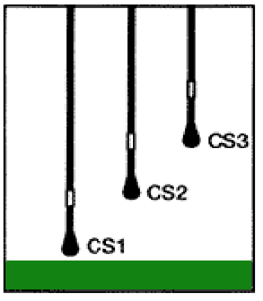


E-DPDT (cross wired)



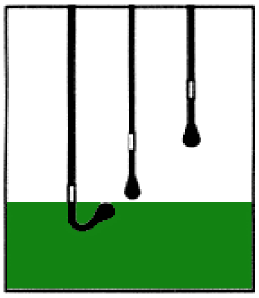
STEP 1

This example illustrates the normal operation of the alternator in a pump down application with three normally open-dry float switches. The switches are numbered CS1, CS2 and CS3 and designated off, lead and lag. The example begins with switches open and both loads de- energized.



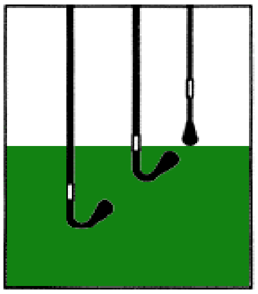
STEP 2

As the fluid level rises, CS1 closes. Neither load energizes.



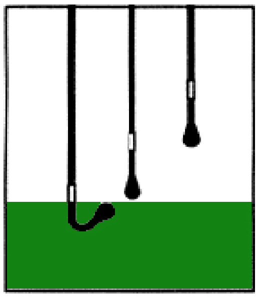
STEP 3

If the fluid level continues to rise, CS2 closes and load M1 energizes, closing the auxiliary M1 contacts.



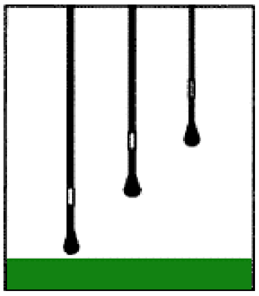
STEP 4

As the fluid level falls and CS2 opens, load M1 remains energized through the auxiliary M1 contact.



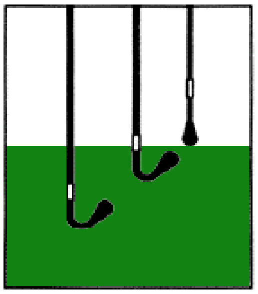
STEP 5

When the level is pumped below CS1, M1 load and auxiliary contacts de-energize and the alternator toggles to position 2.



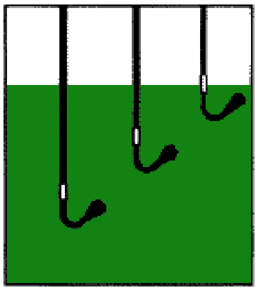
STEP 6

As the fluid level rises to close CS1 and CS2, load M2 energizes.



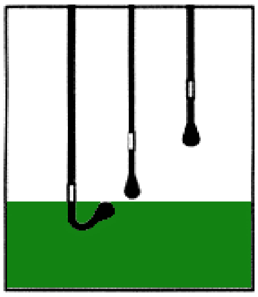
STEP 7

If the level continues to rise closing CS3, load M1 energizes.



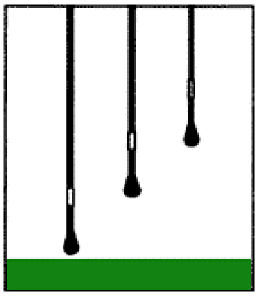
STEP 8

As the fluid is pumped below CS3 and CS2, both loads remain energized through the auxiliary contacts.



STEP 9

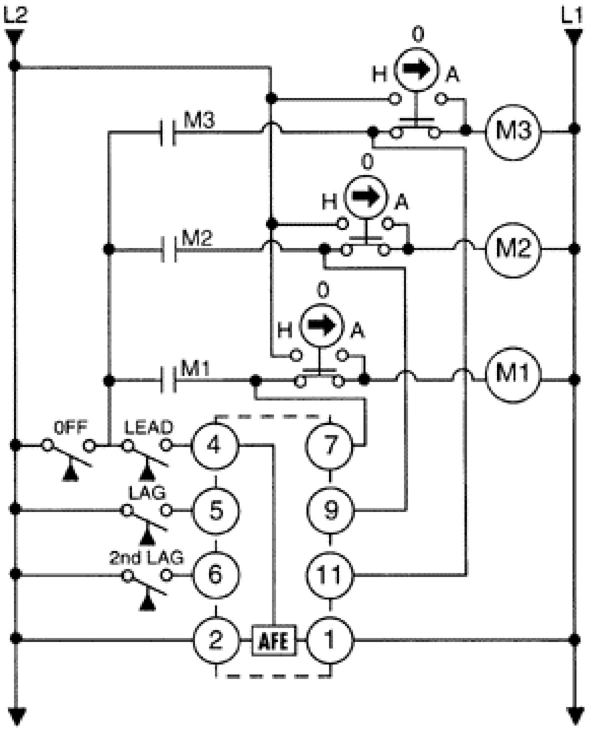
When the level is below CS1 both loads de- energize and the alternator toggles to position 1, and steps 1-9 will be repeated.

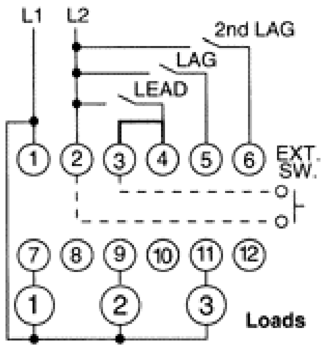


ARA-XXX-AFE, TRIPPLEXOR 3 PUMP, 4 SWITCH OPERATION

For automatic alternations, a factory-installed jumper is in place between terminals 3 and 4. The alternating action is accomplished when the control switch between terminals 2 and 4 opens.

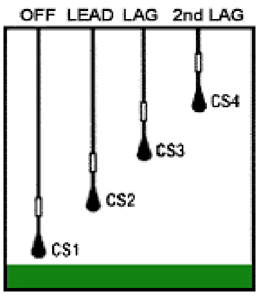
For external clocking alternations, remove the factory-installed jumper between terminals 3 and 4 and place an isolated normally open switch between terminals 2 and 3. The alternating action will occur each time this isolated switch is closed and then re-opened.





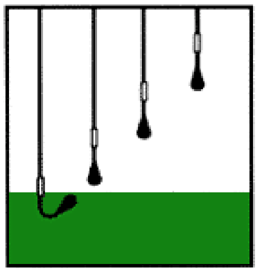
STEP 1

This example illustrates the normal operation of the alternator in a pump down application with four normally-open-dry float switches. The switches are numbered CS1-CS4 and designated off, lead, lag and 2nd lag. The example begins with switches open and all loads de-energized.



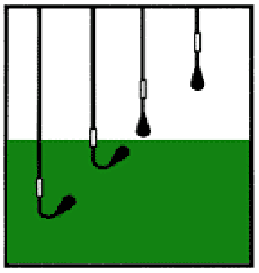
STEP 2

As the fluid level rises CS1 closes. No loads are energized.



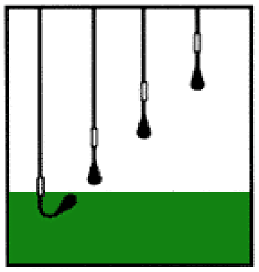
STEP 3

If the fluid level continues to rise CS2 closes, and load M1 energizes closing the auxiliary M1 contact.



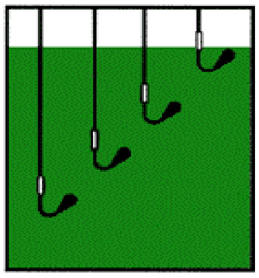
STEP 4

As the level falls CS2 opens, load M1 remains energized through the auxiliary contact M1.



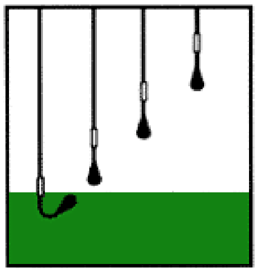
STEP 5

Assuming that the level did not fall but continued to rise, closure of CS3 will energize load M2 and closure of CS4 will energize load M3.



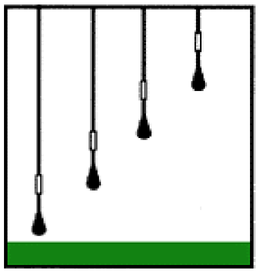
STEP 6

As the fluid level falls below each successive float, the loads M1-3 remain energized through their respective auxiliary contacts.



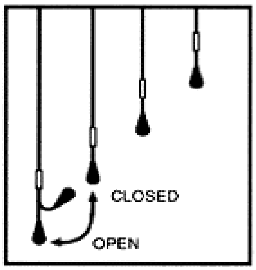
STEP 7

When CS1 opens all loads de-energize and the Alternating Relay toggles to Position #2 thus enabling M2 to become the lead load upon the next closure of CS2.



STEP 8

Each successive rise and fall in fluid level that allows the closing and opening of CS1, toggles the lead load position controlled by CS2 as follows: 1-2-3, 2-3-1, 3-2-1, 1-2-3, etc.

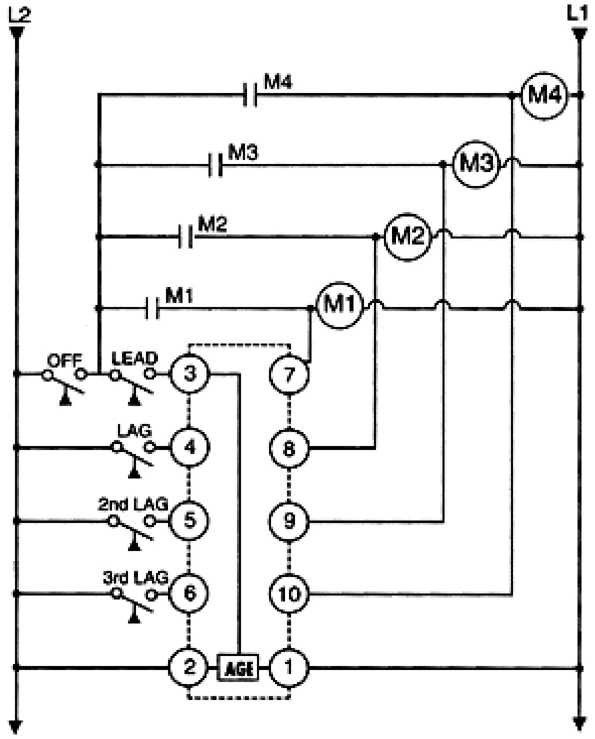


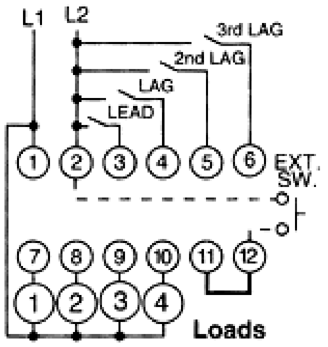
ARA-XXX-AGE, QUADRAPLEXOR, 4 PUMP, 5 SWITCH OPERATION

For automatic alternations, a factory-installed jumper is in place between terminals 11 and 12. The alternating action is accomplished when the control switch between terminals 2 and 3 opens.

For external clocking alternations, remove the factory-installed jumper between terminals 11 and 12 and place an isolated normally open switch between terminals 2 and 12. The alternating action will occur each time this isolated switch is closed and then re-opened.

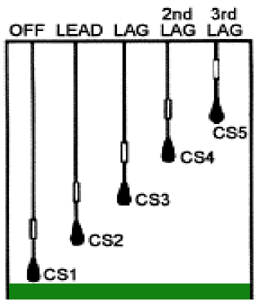
In the event of a power failure, the Alternating Relays will return to their quiescent state and continue sequencing loads on one-at-a-time.





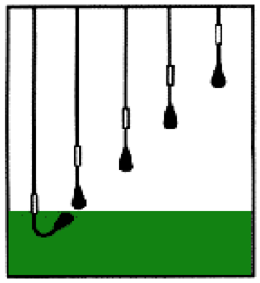
STEP 1

This example illustrates the normal operation of the alternator in a pump down application with five normally-open-dry float switches. The switches are numbered CS1-CS5 and designated off, lead, lag, 2nd lag, and 3rd lag. The example begins with switches open and all loads de-energized.



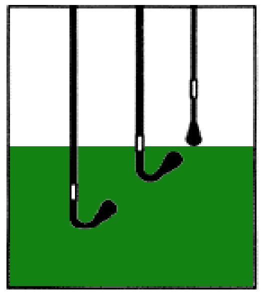
STEP 2

As the fluid level rises CS1 closes. No leads are energized.



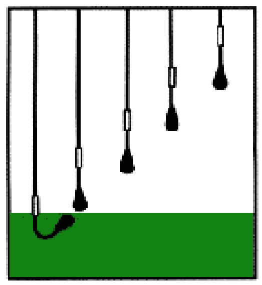
STEP 3

If the fluid level continues to rise CS2 closes and load M1 energizes closing the auxiliary M1 contact.



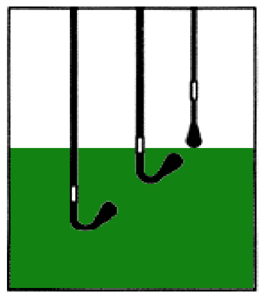
STEP 4

As the level falls CS2 opens, load M1 remains energized through the auxiliary contact M1.



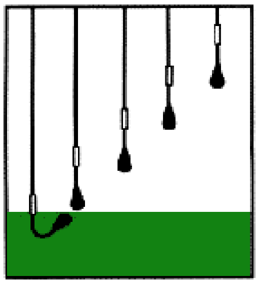
STEP 5

Assuming that the level did not fall but continued to rise, the closure of CS3 will energize load M2. Closure of CS4 will energize load M3. Closure of CS5 will energize load M4.



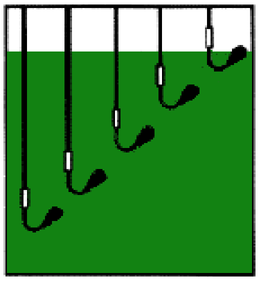
STEP 6

As the fluid level falls below each successive float, the loads M1-4 remain energized through their respective auxiliary contacts.



STEP 7

When CS1 opens all loads de-energize and the Alternating Relay toggles to Position #2 thus enabling M2 to become the lead load upon the next closure of CS2.



STEP 8

Each successive rise and fall in fluid level that allows the closing and opening of CS1 toggles the lead load position controlled by CS2 as follows: 1-2-3-4, 2-3-4-1, 3-4-1-2, 4-1-2-3, 1-2-3-4, etc.