tekmar® - Data Brochure

Pump Sequencer 132

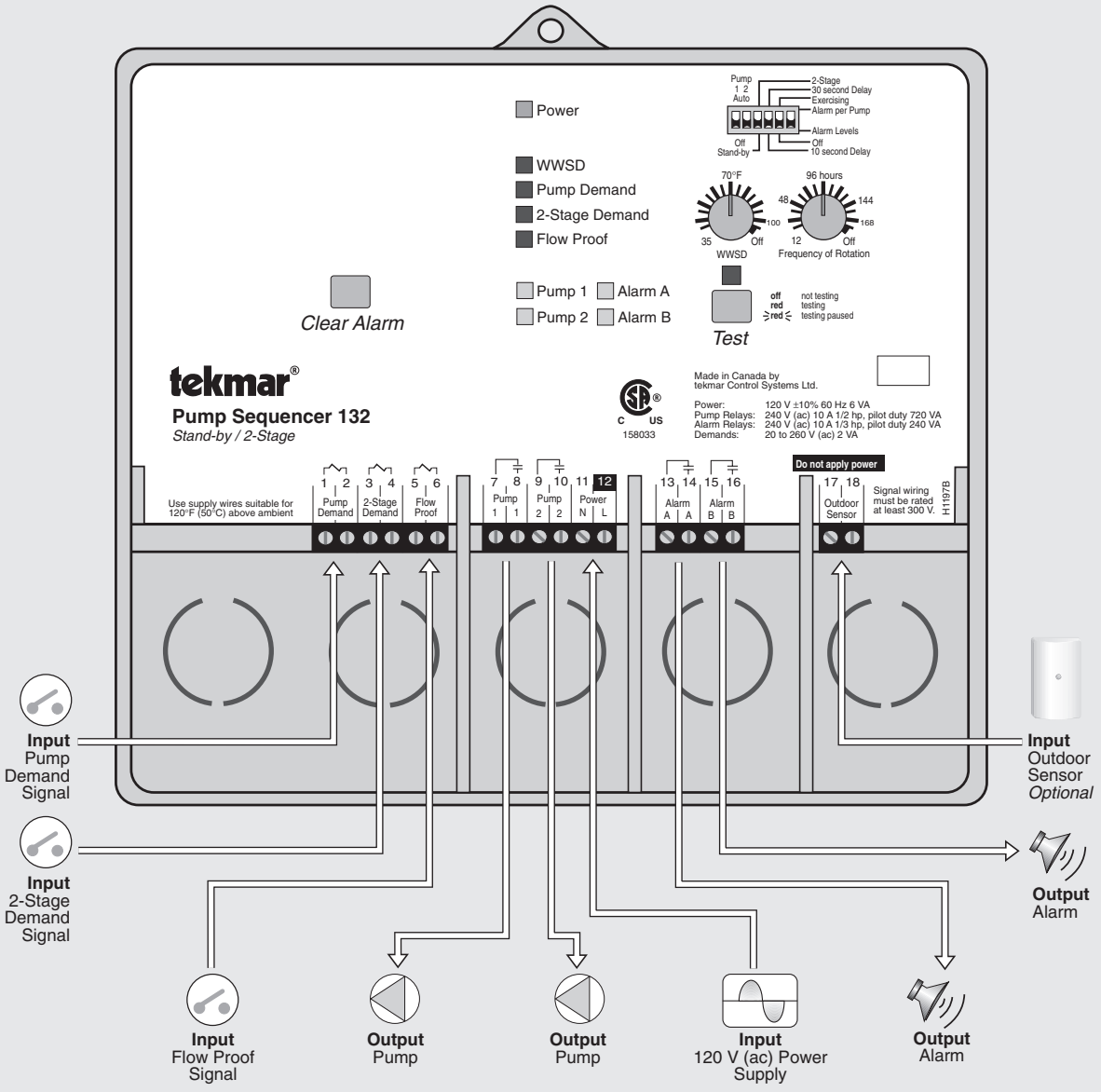
D 132

05/00

The Pump Sequencer 132 is designed to provide pump control for either stand-by or 2-stage operation. In stand-by mode, the 132 automatically switches over from the lead pump to the stand-by pump during a pump failure. In 2-stage mode, the 132 turns on the second stage pump to meet additional flow requirements.

Additional functions include:

- Warm Weather Shut Down (WWSD)
- Exercising
- Equal Run Time Rotation
- Alarm per Pump or Alarm Levels
- Adjustable flow proof delay
- Test sequence to ensure proper component operation
- 120 V (ac) power supply
- CSA C US certified (approved to applicable UL standards)



How To Use The Data Brochure

This brochure is organized into three main sections. They are: 1) *Sequence of Operation*, 2) *Installation*, 3) *Troubleshooting*. The *Sequence of Operation* section has three sub-sections. We recommend reading Section A: *General Operation* of the *Sequence of Operation*, as this contains important information on the overall operation of the control. Then read the sub-sections that apply to your installation.

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Sequence of Operation

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Section A — General Operation

POWERING UP THE CONTROL

When the Pump Sequencer 132 is powered up, a software version code is displayed for 2 seconds, then the control turns on all of the red LED's for 2 seconds. After this test, the control enters its normal operating mode. When the control is powered up, the *Power* light remains on continuously.

OPERATION

The Pump Sequencer 132 has two modes of operation. The 132 is capable of operating two pumps in either a stand-by or 2-stage configuration.

Stand-by

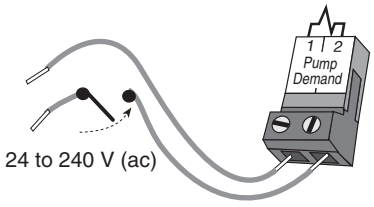
In the stand-by mode of operation the 132 automatically switches over from the lead pump to the stand-by pump if the lead pump fails to provide flow in the system.

2-Stage

In the 2-stage mode of operation the 132 turns on the second stage pump if there is a requirement for additional flow in the system. At the same time the control still provides stand-by pump operation.

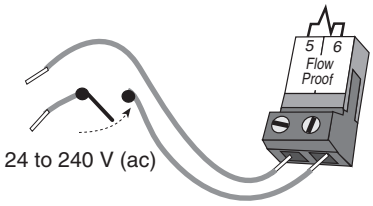
PUMP DEMAND

A pump demand is required in order for the 132 to provide flow. A pump demand is generated by applying a voltage between 24 and 240 V (ac) across the *Pump Demand* terminals (1 and 2). Once voltage is applied, the *Pump Demand* light is turned on and the pump(s) operate as required. A pump demand can be permanently powered, or generated from an external source such as a manual switch or another control system.



FLOW PROOF

A flow proof signal is required at all times during pump operation. A flow proof is generated by applying a voltage between 24 and 240 V (ac) across the *Flow Proof* terminals (5 and 6). Once voltage is applied, the *Flow Proof* light is turned on. Once a pump contact is turned on, a flow proof signal must be present before the flow proof delay has expired. A flow proof can come from a flow switch, pressure differential switch, current sensing switch, or power sensing switch.



FLOW PROOF DELAY (*30 second Delay / 10 second Delay*)

The 132 allows a time delay for detecting a flow proof signal once a pump contact is turned on. The amount of time is adjustable from 10 to 30 seconds through a DIP switch. If a flow proof signal is not present within the selected time, the control turns off the first pump contact and turns on the second pump contact. An alarm contact is activated to indicate the failure.

FLOW PROOF TEST

The 132 has a flow proof test in order to determine if the flow proof device has failed. Once the pump contacts are turned off, a flow proof signal should not be present. If a flow proof signal is still present after 4 minutes, the control activates an alarm contact and displays an error message. Refer to the *Error Messages* section at the back of this brochure.

ROTATION

The 132 has a function which automatically changes the operating sequence of the pumps based on *Equal Run Time Rotation*. *Equal Run Time Rotation* is based on pump running hours and allows for equal usage of both pumps. The 132 uses the *Frequency of Rotation* dial to set the rotation of the pumps.

The control rotates the operating sequence of the pumps when the pumps are off. In a constant circulation system where the lead pump runs continuously, the control waits for up to 12 hours to rotate the operating sequence of the pumps.

Note: The *Equal Run Time Rotation* function is reset by pressing the ***Clear Alarm*** button.

EXERCISING

The 132 has a built-in pump exercising function. This function is only operational if the *Exercising / Off* DIP switch is set to *Exercising*. If a pump has not been operated at least once every three days, the control turns on the output for 10 seconds. This minimizes the possibility of a pump seizing during a long period of inactivity.

Note: The exercising function does not work if power to the control or pumps is off.

WARM WEATHER SHUT DOWN (WWSD)

When the 132 is used as a stand alone control, the pumps can be operated based on outdoor air temperature. The WWSD feature is only operational when an outdoor sensor is installed and the *WWSD* dial is not set to *Off*. When the outdoor air temperature rises above the WWSD setting, the 132 turns on the *WWSD* light. When the control is in Warm Weather Shut Down, the demand LED's are displayed if there is a demand. However, the control does not operate the pumps to satisfy these demands. If the 132 receives a pump demand from a reset control, the outdoor sensor should not be installed and the *WWSD* dial must be set to *Off*.

Section B: Pump Operation

Section B1
Stand-by

Section B2
2-Stage

Section B1: Stand-by

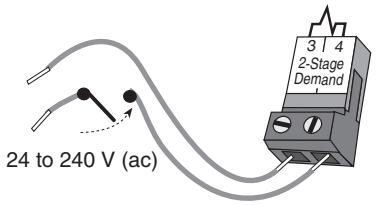
PUMP OPERATION

The lead pump contact closes whenever there is a pump demand and the 132 is not in WWSD. If a flow proof is not present after the flow proof delay has expired, the control turns off the lead pump contact and turns on the stand-by pump contact. An alarm contact is activated to indicate the failure. The stand-by pump contact also turns off if a flow proof is not obtained once the flow proof delay has expired.

Section B2: 2-Stage

2-STAGE DEMAND

A 2-stage demand is required in order for the 132 to provide additional flow. A 2-stage demand is generated by applying a voltage between 24 and 240 V (ac) across the *2-Stage Demand* terminals (3 and 4). Once voltage is applied, the *2-Stage Demand* light is turned on. A 2-stage demand can come from an additional pressure differential switch, a temperature differential device, or a setpoint control based on an outdoor air temperature.



Note: The 2-stage demand device should provide an appropriate differential to prevent the second stage pump from short cycling.

PUMP OPERATION

The first stage pump contact closes whenever there is a pump demand and the 132 is not in WWSD. The second stage pump contact closes whenever there is a pump demand, flow proof, 2-stage demand, and the 132 is not in WWSD.

If flow is not established by the first stage pump, the 132 turns off the first stage pump contact and turns on the second stage pump contact. An alarm contact is activated to indicate the failure. The second stage pump contact also turns off if a flow proof is not obtained once the flow proof delay has expired.

Section C: Alarm Operation

Section C1
Alarm Levels

Section C2
Alarm per Pump

There are two alarm contacts (*Alarm A* and *Alarm B*) on the Pump Sequencer 132. These contacts are used to indicate either pump or control failures. The alarm contacts have two modes of operation. The mode of operation for the alarm contacts is selected using the *Alarm per Pump / Alarm Levels* DIP switch. When an alarm contact is activated, refer to the *Error Messages* section of this brochure to determine the cause of the alarm signal. To clear an alarm, press the ***Clear Alarm*** button.

Section C1: Alarm Levels

When operating in the *Alarm Levels* mode, the alarm contacts are used to indicate the level of failure in the system.

ALARM A (Non-Critical)

The *Alarm A* contact closes when a non-critical failure occurs. Non-critical failures include: a single pump failure, a control error, an outdoor sensor failure, or short cycling of the 2-stage demand. With these failures, it is still possible to establish flow in the system.

ALARM B (Critical)

The *Alarm B* contact closes when a critical failure occurs. Critical failures include: the failure of both pumps, or a failure of the flow proof device. With these failures, the control is no longer able to operate the pumps, and it is not possible to provide flow.

Section C2: Alarm per Pump

When operating in *Alarm per Pump* mode, the alarm contacts are related to the pump contacts on the control. The *Alarm A* contact closes anytime *Pump 1* fails, and the *Alarm B* contact closes anytime *Pump 2* fails. The *Alarm A* contact also closes to indicate an outdoor sensor failure, a control error, a flow proof device failure, or if the 2-stage demand is short cycling.

Installation

CAUTION

Improper installation and operation of this control could result in damage to the equipment and possibly even personal injury. It is your responsibility to ensure that this control is safely installed according to all applicable codes and standards. This electronic control is not intended for use as a primary limit control. Other controls that are intended and certified as safety limits must be placed into the control circuit.

STEP ONE — GETTING READY

Check the contents of this package. If any of the contents listed are missing or damaged, please contact your wholesaler or tekmar sales representative for assistance.

Type 132 includes: One Pump Sequencer 132, Data Brochures D 132, D 001, Application Brochure A 132

Note: Carefully read the details of the *Sequence of Operation* to ensure that you have chosen the proper control for your application.

STEP TWO — MOUNTING THE BASE

Remove the control from its base by pressing down on the release clip in the wiring chamber and sliding the control away from it. The base is then mounted in accordance with the instructions in the Data Brochure D 001.

STEP THREE — ROUGH-IN WIRING

All electrical wiring terminates in the control base wiring chamber. The base has standard 7/8" (22 mm) knockouts which accept common wiring hardware and conduit fittings. Before removing the knockouts, check the wiring diagram and select those sections of the chamber with common voltages. Do not allow the wiring to cross between sections as the wires will interfere with safety dividers which should be installed at a later time.

Power must not be applied to any of the wires during the rough-in wiring stage.

- If an Outdoor Sensor 070 is used, install the outdoor sensor according to the instructions in the Data Brochure D 070 and run the wiring back to the control.
- Run wire from other system components (pumps, alarms, etc.) to the control.
- Run wires from the 120 V (ac) power to the control. Use a clean power source to ensure proper operation. Multi-strand 16 AWG wire is recommended for all 120 V (ac) wiring due to its superior flexibility and ease of installation into the terminals.

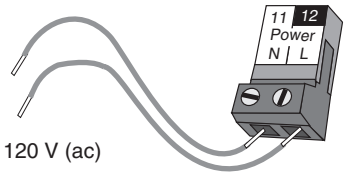
STEP FOUR — ELECTRICAL CONNECTIONS TO THE CONTROL

The installer should test to confirm that no voltage is present at any of the wires. Push the control into the base and slide it down until it snaps firmly into place.

Powered Input Connections

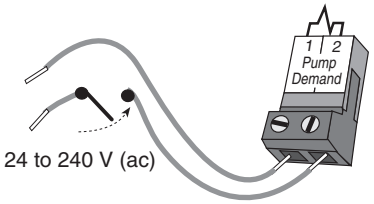
120 V (ac) Power

Connect the 120 V (ac) power supply to the *Power N* and *Power L* terminals (11 and 12). This connection provides power to the microprocessor.



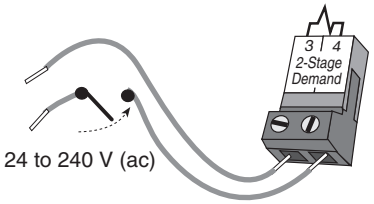
Pump Demand

To generate a pump demand, a voltage between 24 V (ac) and 240 V (ac) must be applied across the *Pump Demand* terminals (1 and 2).



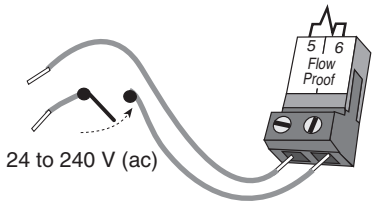
2-Stage Demand

To generate a 2-stage demand, a voltage between 24 V (ac) and 240 V (ac) must be applied across the *2-Stage Demand* terminals (3 and 4).



Flow Proof

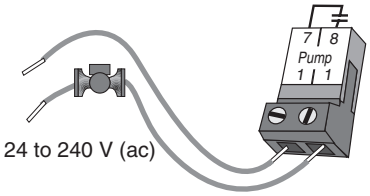
To generate a flow proof, a voltage between 24 V (ac) and 240 V (ac) must be applied across the *Flow Proof* terminals (5 and 6).



Output Connections

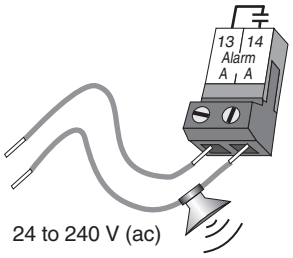
Pump Contacts

The *Pump 1* and *Pump 2* terminals (7, 8 and 9, 10) are isolated outputs in the 132. There is no power available on these terminals from the control. These terminals are to be used as a switch to either make or break power to the pump circuit. Since these are isolated contacts, they may switch a voltage between 24 V (ac) and 240 V (ac).



Alarm Contacts

The *Alarm A* and *Alarm B* terminals (13, 14 and 15, 16) are isolated outputs in the 132. There is no power available on these terminals from the control. These terminals are to be used as a switch to either make or break power to the alarm circuit. Since these are isolated contacts, they may switch a voltage between 24 V (ac) and 240 V (ac).



Outdoor Sensor Connection

Do not apply power to these terminals as this will damage the control.

Outdoor Sensor (Optional)

Connect the two wires from the Outdoor Sensor 070 to the *Outdoor Sensor* terminals (17 and 18). The outdoor sensor is used by the 132 to measure the outdoor air temperature.

Note: If an outdoor sensor is not installed, the *WWSD* dial must be set to *Off*.

STEP FIVE — TESTING THE WIRING

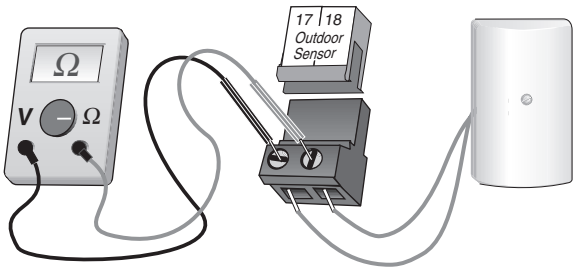
Each terminal block ***must be unplugged*** from its header on the control before power is applied for testing. To remove a terminal block, pull it straight down from the control.

The following tests are to be performed using standard testing practices and procedures, and should only be carried out by properly trained and experienced persons.

A good quality electrical test meter, capable of reading from at least 0 - 300 V (ac) and at least 0 - 2,000,000 Ohms, is essential to properly test the wiring and sensor.

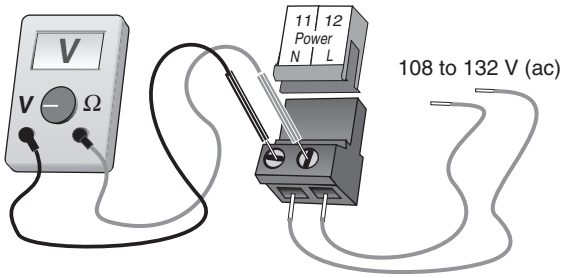
Test The Sensor

In order to test the sensor, the actual temperature at the sensor location must be measured. A good quality digital thermometer with a surface temperature probe is recommended for ease of use and accuracy. Where a digital thermometer is not available, a spare sensor can be placed alongside the one to be tested and the readings compared. Test the sensor according to the instructions in the Data Brochure D 070.



Test The Power Supply

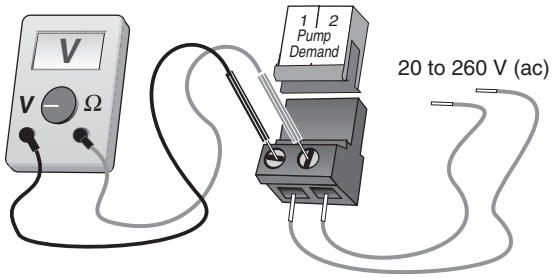
Make sure exposed wires and bare terminals are not in contact with other wires or grounded surfaces. Turn on the power and measure the voltage between the *Power N* and *Power L* terminals (11 and 12) using an AC voltmeter. The reading should be between 108 and 132 V (ac).



Test The Powered Inputs

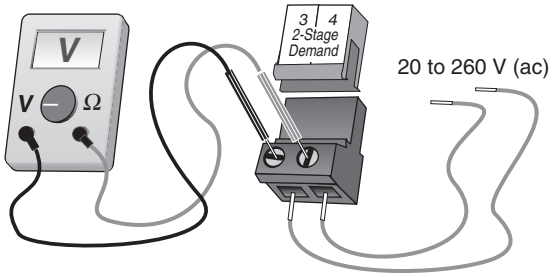
Pump Demand

Measure the voltage between the *Pump Demand* terminals (1 and 2). When the pump demand device calls for flow, you should measure between 20 and 260 V (ac) at the terminals. When the pump demand device is off, you should measure less than 5 V (ac).



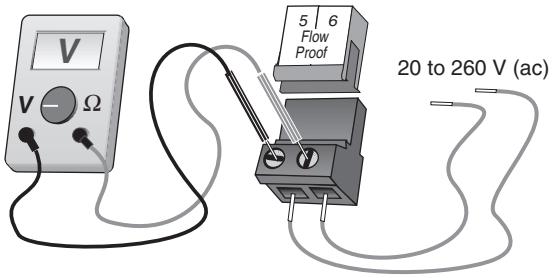
2-Stage Demand

If a 2-stage demand is used, measure the voltage between the *2-Stage Demand* terminals (3 and 4). When the 2-stage demand device calls for flow, you should measure between 20 and 260 V (ac) at the terminals. When the 2-stage demand device is off, you should measure less than 5 V (ac).



Flow Proof

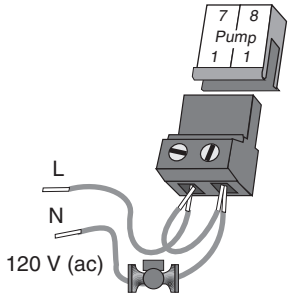
Measure the voltage between the *Flow Proof* terminals (5 and 6). When the flow proof device is energized, you should measure between 20 and 260 V (ac) at the terminals. When the flow proof device is off, you should measure less than 5 V (ac).



Test The Outputs

Pump 1 and Pump 2

Make sure power to the terminal block is off and install a jumper between *Pump 1* terminals (7 and 8). When the pump circuit is powered up, the pump should start. If the pump does not turn on, check the wiring between terminal block and pump and refer to any installation or troubleshooting information supplied with the pump. If the pump operates properly, disconnect the power and remove the jumper. Repeat the above procedure for *Pump 2* terminals (9 and 10).



Alarm A and Alarm B

If an alarm is connected to the *Alarm A* terminals (13 and 14), make sure power to the alarm circuit is off and install a jumper between the terminals. When the alarm circuit is powered up, the alarm should turn on. If the alarm does not turn on, check the wiring between the terminal block and alarm and refer to any installation or troubleshooting information supplied with the alarm. If the alarm operates properly, disconnect the power and remove the jumper. If an alarm is connected to the *Alarm B* terminals (15 and 16), repeat the above procedure for *Alarm B*.

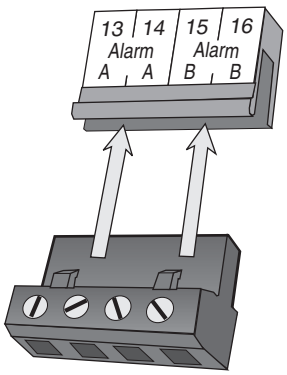
Connecting The Control

Make sure all power to the devices and terminal blocks is off, and remove any remaining jumpers from the terminals.

Reconnect the terminal blocks to the control by carefully aligning them with their respective headers on the control and then pushing the terminal blocks into the headers. The terminal blocks should snap firmly into place.

Install the supplied safety dividers between the unpowered sensor input and the powered 120 V (ac) or 24 V (ac) wiring chambers.

Apply power to the control. The operation of the control on power up is described in the *Sequence of Operation* section of this brochure.

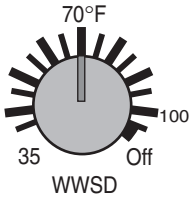


Settings

WARM WEATHER SHUT DOWN (WWSD)

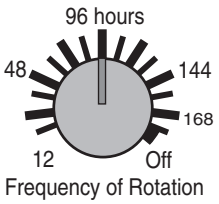
The *WWSD* dial is only operational when an outdoor sensor is installed. The WWSD dial can be set from 35 to 100°F or Off (2 to 38°C or Off). Refer to section A.

Note: If an outdoor sensor is not installed, the *WWSD* dial must be set to *Off*.



FREQUENCY OF ROTATION

The *Frequency of Rotation* dial can be set from 12 to 168 hours or Off. Refer to section A.



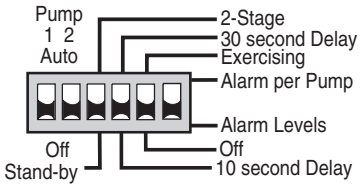
DIP SWITCH SETTINGS

Pump 1 Auto / Off

The *Pump 1 Auto / Off* DIP switch is used to select pump 1 operation. If the DIP switch is set to *Pump 1 Auto*, refer to section B.

Pump 2 Auto / Off

The *Pump 2 Auto / Off* DIP switch is used to select pump 2 operation. If the DIP switch is set to *Pump 2 Auto*, refer to section B.



2-Stage / Stand-by

The *2-Stage / Stand-by* DIP switch is used to select which mode of pump control is required. If *2-Stage* is selected, refer to section B2, and if *Stand-by* is selected, refer to section B1.

30 second Delay / 10 second Delay

The *30 second Delay / 10 second Delay* DIP switch is used to select what time delay is required to prove flow once a pump contact is turned on. Refer to section A.

Exercising / Off

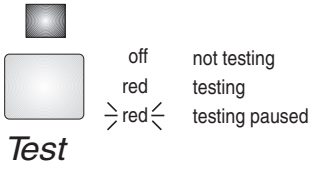
The *Exercising / Off* DIP switch is used to select exercising. If the DIP switch is set to *Exercising*, refer to section A.

Alarm per Pump / Alarm Levels

The *Alarm per Pump / Alarm Levels* DIP switch is used to select which mode of alarm operation is required. Refer to section C.

Testing the Control

The Pump Sequencer 132 has a built-in test routine which is used to test the main control functions. The 132 continually monitors the outdoor sensor (if installed) and displays an error message whenever a fault is found. See the following page for a list of the 132's error messages. When the ***Test*** button is pressed, the test light is turned on. The individual outputs and relays are tested in the following test sequence.



TEST SEQUENCE

Each step in the test sequence lasts 10 seconds.

During the test routine, the test sequence is paused by pressing the ***Test*** button. If the ***Test*** button is not pressed again for 5 minutes while the test sequence is paused, the control exits the entire test routine. If the test sequence is paused, the ***Test*** button can be pressed again to advance to the next step. This can also be used to rapidly advance through the test sequence. To reach the desired step, repeatedly press and release the ***Test*** button until the appropriate LED is turned on.

Step 1 - *Pump 1* contact is turned on for 10 seconds. After 10 seconds, the *Pump 1* contact is shut off.
Note: Only if there is a pump demand can the control be paused in step 1.

Step 2 - *Pump 2* contact is turned on for 10 seconds. After 10 seconds, the *Pump 2* contact is shut off.
Note: Only if there is a pump demand can the control be paused in step 2.

Step 3 - *Alarm A* contact is turned on for 10 seconds. After 10 seconds, the *Alarm A* contact is shut off.

Step 4 - *Alarm B* contact is turned on for 10 seconds. After 10 seconds, the *Alarm B* contact is shut off.

ERROR HANDLING

If an internal control fault occurs, the 132 displays an error message and turns on the *Alarm A* contact. In this case the control continues operation. To clear the error message from the control, press the ***Clear Alarm*** button. If the error message remains, the control must be returned for repair.

If an outdoor sensor fault occurs and the *WWSD* dial is not set to *Off*, the 132 displays an error message and turns on the *Alarm A* contact. In this case the control operates the pumps based on demands. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press the ***Clear Alarm*** button.

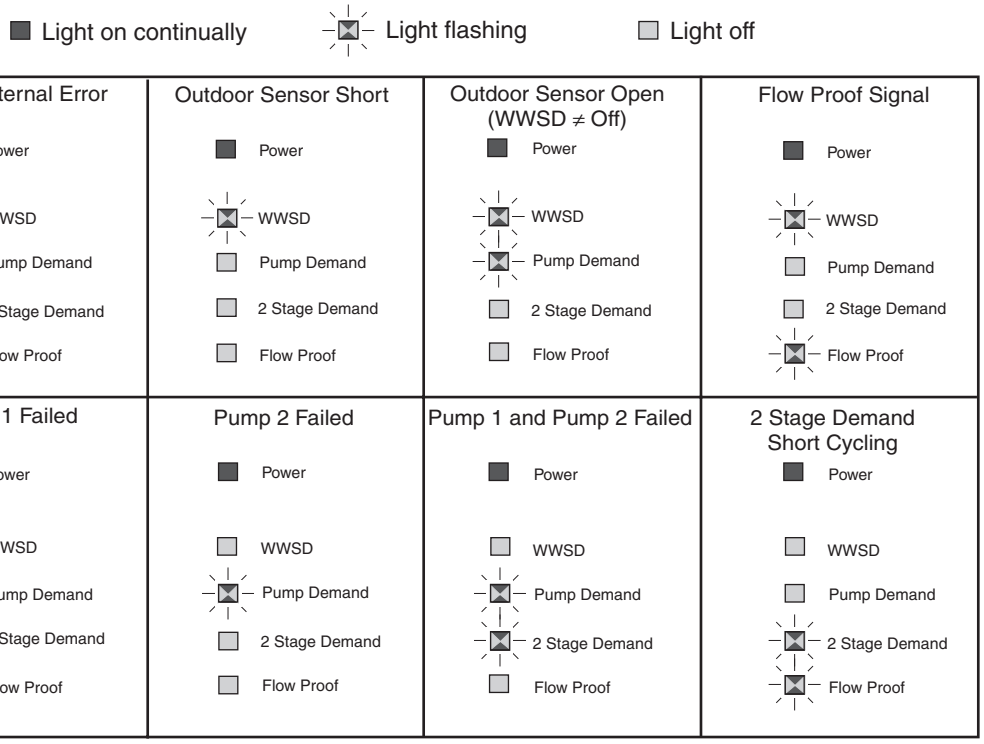
If a flow proof signal is present when both pump contacts have been off for more than 4 minutes, the 132 displays an error message and turns on an alarm contact. In this case the control will stop operation. To clear the error message from the control after the fault is corrected, press the ***Clear Alarm*** button.

If a pump fails, the appropriate error message and alarm signal is displayed. To clear the error message from the control after the fault is corrected, press the ***Clear Alarm*** button.

If the 2-stage demand short cycles, the 132 displays an error message and turns on the *Alarm A* contact. In this case the control continues operation. To clear the error message from the control after the fault is corrected, press the ***Clear Alarm*** button.

Error Messages

Whenever a fault is detected, the indicator lights will flash in specific ways to indicate the problem. The appropriate alarm contact also turns on. To clear the error message from the control after the fault is corrected, press the ***Clear Alarm*** button.



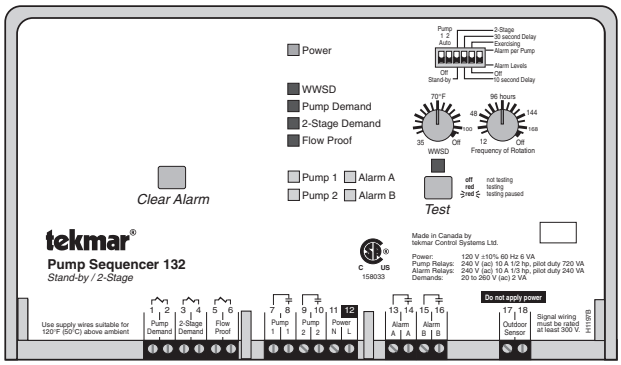
Notes

Notes

Technical Data

Pump Sequencer 132 *Stand-by / 2-Stage*

Literature	—	D 132, A 132's, D 001.
Control	—	Microprocessor control; This is **not a safety (limit) control**.
Packaged weight	—	2.9 lb. (1320 g), Enclosure A, blue PVC plastic
Dimensions	—	6-5/8" H x 7-9/16" W x 2-13/16" D (170 x 193 x 72 mm)
Approvals	—	CSA C US, meets ICES & FCC regulations for EMI/RFI.
Ambient conditions	—	Indoor use only, 32 to 120°F (0 to 50°C), < 90% RH non-condensing.
Power supply	—	120 V ±10% 60 Hz 6 VA
Pump Relays	—	240 V (ac) 10 A 1/2 hp, pilot duty 720 VA
Alarm Relays	—	240 V (ac) 10 A 1/3 hp, pilot duty 240 VA
Demands	—	20 to 260 V (ac) 2 VA
Sensor	—	NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) ß=3892
Optional:		Outdoor Sensor 070



The installer must ensure that this control and its wiring are isolated and/or shielded from strong sources of electromagnetic noise. Conversely, this Class B digital apparatus complies with Part 15 of the FCC Rules and meets all requirements of the Canadian Interference-Causing Equipment Regulations. However, if this control does cause harmful interference to radio or television reception, which is determined by turning the control off and on, the user is encouraged to try to correct the interference by reorienting or relocating the receiving antenna, relocating the receiver with respect to this control, and/or connecting the control to a different circuit from that to which the receiver is connected.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Caution The nonmetallic enclosure does not provide grounding between conduit connections. Use grounding type bushings and jumper wires.

Attention Un boîtier nonmétallique n'assure pas la continuité électrique des conduits. Utiliser des manchons ou des fils de accord spécialement conçus pour la mise á la terre.

Limited Warranty and Product Return Procedure

Limited Warranty The liability of tekmar Control Systems Ltd. and tekmar Control Systems, Inc. ("tekmar") under this warranty is limited. The purchaser, by taking receipt of the tekmar product ("product"), acknowledges receipt of the terms of the warranty and acknowledges that it has read and understands same.

tekmar warrants each tekmar product against defects in workmanship and materials, if the product is installed and used in compliance with tekmar's instructions. The warranty period is for a period of twenty-four (24) months from the production date if the product is not installed during that period, or twelve (12) months from the documented date of installation if installed within twenty-four (24) months from the production date.

The liability of tekmar under this warranty shall be limited to, at tekmar's sole discretion: the cost of parts and labor provided by tekmar to repair defects in materials and/or workmanship of the defective product; or to the exchange of the defective product for a replacement product; or to the granting of credit limited to the original cost of the defective product, and such repair, exchange or credit shall be the sole remedy available from tekmar, and, without limiting the foregoing in any way, tekmar is not responsible, in contract, tort or strict product liability, for any other losses, costs, expenses, inconveniences, or damages, whether direct, indirect, special, secondary, incidental or consequential, arising from ownership or use of the product, or from defects in workmanship or materials, including any liability for fundamental breach of contract.

This warranty applies only to those products returned to tekmar during the warranty period. This warranty does not cover the cost of the parts or labor to remove or transport the defective product, or to reinstall the repaired or replacement product. Returned products that are not defective are not covered by this warranty.

This warranty does not apply if the product has been damaged by negligence by persons other than tekmar, accident, fire, Act of God, abuse or misuse; or has been damaged by modifications, alterations or attachments made subsequent to purchase which have not been authorized by tekmar; or if the product was not installed in compliance with tekmar's instructions and the local codes and ordinances; or if due to defective installation of the product; or if the product was not used in compliance with tekmar's instructions.

This warranty is in lieu of all other warranties, express or implied, which the Governing Law (being the law of British Columbia) allows parties to contractually exclude, including, without limitation, warranties of merchantability, fitness for a particular purpose, durability or description of the product, its non-infringement of any relevant patents or trademarks, and its compliance with or non-violation of any applicable environmental, health or safety legislation; the term of any other warranty not hereby contractually excluded is limited such that it shall not extend beyond twenty-four (24) months from the production date, to the extent that such limitation is allowed by the Governing Law.

Product Return Procedure Products that are believed to have defects in workmanship or materials must be returned, together with a written description of the defect, to the tekmar representative for that territory. If the address of the representative is not known, please request it from tekmar at the telephone number listed below**.**

tekmar Control Systems

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