



Model 2020 Liquid Nitrogen Tank Switcher

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Important!

Carefully examine the shipping carton and contents for damage. If carton or contents are damaged, contact Gordinier Elecytronics immediately to file a claim. To preserve the right to claim shipping damages, the unpacking, inspection and filing of the claim must take place promptly. Failure to inspect and file promptly will release the shipper from liability.

Check the contents for apparent shipping damage such as broken knobs, switches or dented cases. If there is any damage, IMMEDIATELY contact the carrier for corrective action. If an operating problem has been detected once the instrument has been properly set up, contact your Goprdirnier Electronics, Inc., distributor or Gordinier Electronics Inc. directly at (586)778-0426.

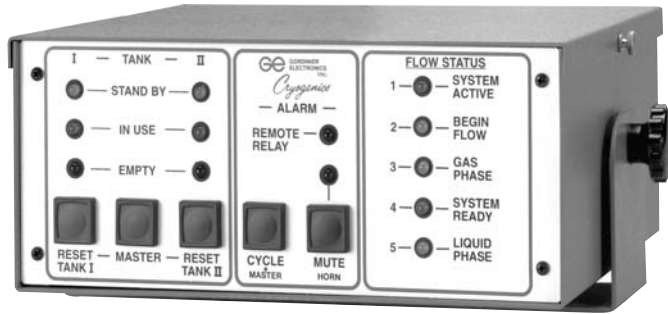


*Read this Entire Instruction Manual
If yo do not understand these instructions, please contact us for
further explanation. Failure to comply may result in damage to
unit or poor equipment performance.*

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Model 2020

2020 System Overview



Model 2020 Front



Model 2020 Back

The 2020 automatic controller for liquid nitrogen is a unique supply tank switching system that maintains liquid control. The controller provides the automatic operation of dual tank switching. A LED gauge reflects the readings of the external temperature probe and monitors the tank condition continuously.

The solid state audible alarm system has a visual indicator and a “push button” to allow you to mute it under close supervision.

The tank switcher is activated by any automatic level filling system. Slave units may be added in quantities of two or more to expand the storage capacity for your specific needs.

The 2020 system and all Gordinier products, carry a conditional one year guarantee on materials and workmanship.

General Description

The following condition

A) A signal generated by the storage units autofilling controller or a valve being activated calling for a fill must be present at the control start plug. This will turn on the manifold valve #1 or #2, along with an integral 1-10 minute time, indicated by the green **System Active** LED.

The thermistor is a cryogenic type with a negative coefficient. By a negative coefficient we mean as the temperature goes down, the resistance goes up to approximately 30K ohms (30,000 ohms). At room temperature the thermistor will fall rapidly to .5 ohms. The liquid nitrogen vapors give a resistance of approximately 6800 ohms. In order to allow a warmer temperature of the system before switching to the next tank, 5600 ohms was chosen.

B) The thermistor sensor probe must cool down to the proper temperature which is indicated by the lighting of the green **System Ready** LED on the front panel (see figure below) located under the set of **Flow Status** Display LEDs, through to the yellow Liquid Phase LED.

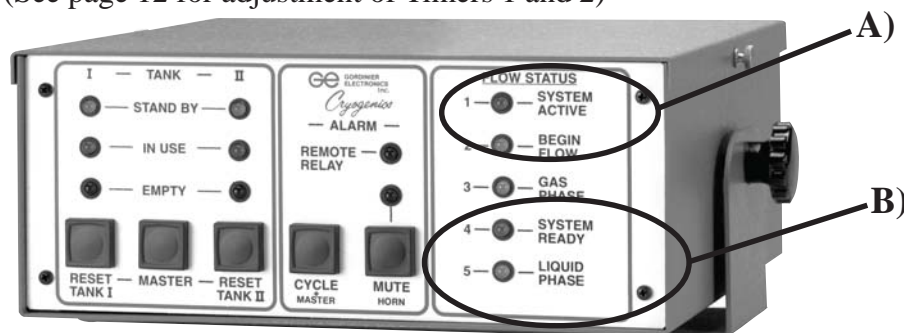
Once the green **System Ready** LED is lit, it must remain lit during the complete filling cycle. When the green **System Ready** LED goes out, the second timer is started and the system will switch to the next tank for the continuation of the filling cycle.

TIMER THEORY OF OPERATION:

Time #1 provides enough time to cool down the manifold and probe for continuous LN2 flow. During this LN2 flow, the supply tank empties and the flow status LEDs begin to go out/ When the #4 LED (System Ready) goes out, the System Ready timer is activated. (Set at 30 seconds)

After 30 seconds, the next supply tank is switched on-line, starting **Timer #2**, allowing enough time to regain LN2 flow. When the Systems active LED #1 goes out all timers are reset to zero.

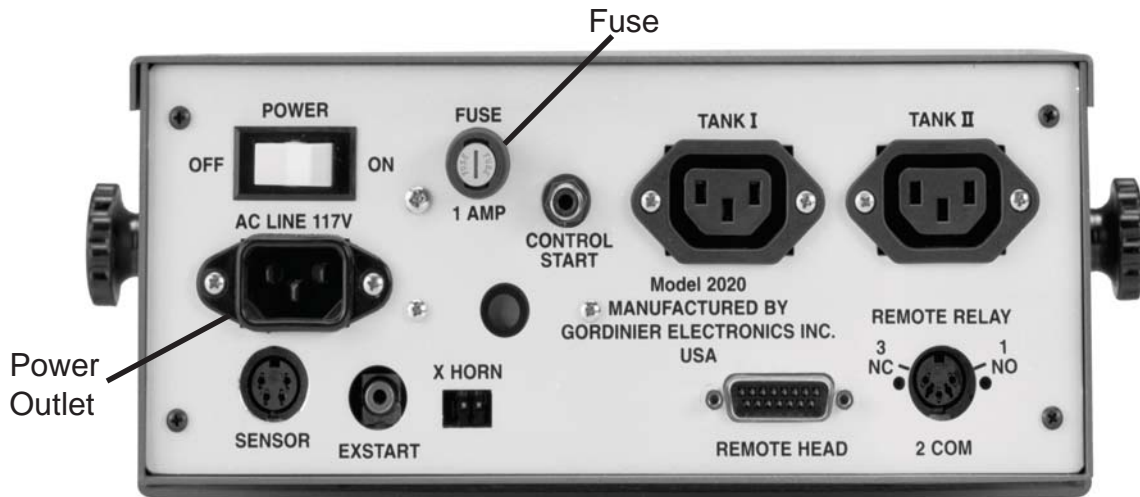
The System Ready Timer is adjustable from 0-1 minute (Factory set at 30 seconds). This allows the #4 LED (System Ready) to fluctuate and not allow the 2020 to switch until the LED remains off the 30 seconds. (See page 12 for adjustment of Timers 1 and 2)



Front Plate

Model 2020

Back Panel Connections



110/220 Volts AC Operation

The Model 2020 is shipped as a 110 volt AC unit or a 220 volt AC unit, whichever was specified when it was ordered. Since there is a wide variation in 220 volt AC plugs, 220 volt AC units are shipped without plugs for which the user must provide the power plug.

*The power transformer has dual primaries which allows either a 110 volt AC or a 220 volt AC operation over a range of a 50/60 HZ line frequency. Units may be converted from 110v AC to 220v AC or vice versa by rearranging the primary side of the transformer.

Grounding

It is imperative for safe and stable operation that the controller be connected to a properly grounded AC outlet. Unfortunately, some of the three prong outlets are not properly grounded. Check to make sure that the outlet to be used is properly connected to a known ground before plugging in the AC power cord.

Fusing

The system uses one fuse. If for some reason the fuse should blow, contact Gordinier Electronics for instructions. The external fuse is a standard 1 amp regular 110 AC, or a .5 amp regular 220 volt AC.

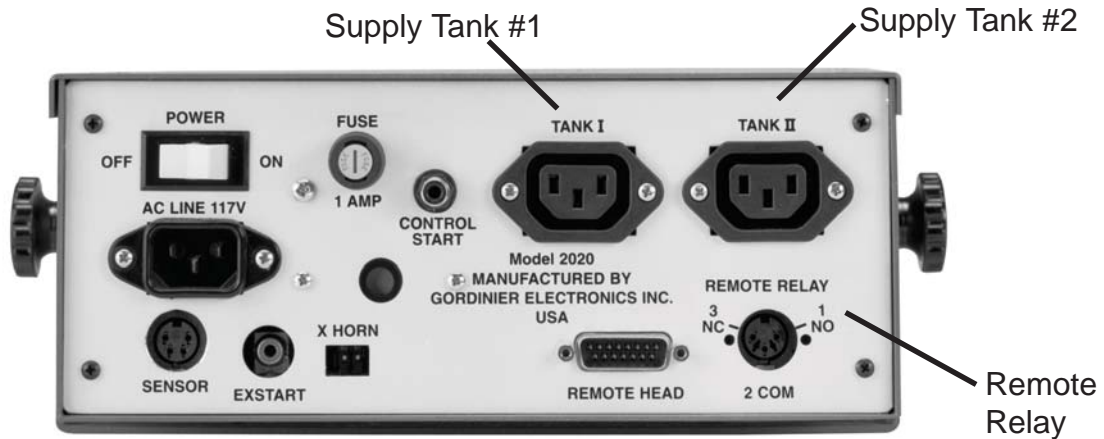
**Note: Circuit board must be changed*



Make sure the power cord is disconnected before working on the Model 2020 controller!

Model 2020

Back Panel Connections



Connecting Valve Plugs

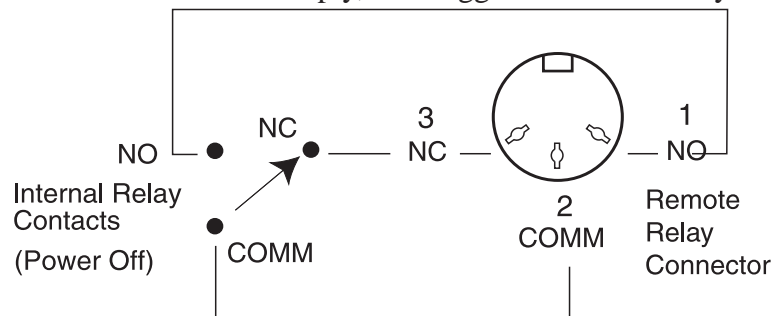
It is important to decide which valve will be used for Supply Tank #1 and Supply Tank #2. When the power is applied to the controller, the system will select Supply Tank #1. After you have made your selection, plug the cord from the selected valve into input receptacles marked Valve #1 or Valve #2.

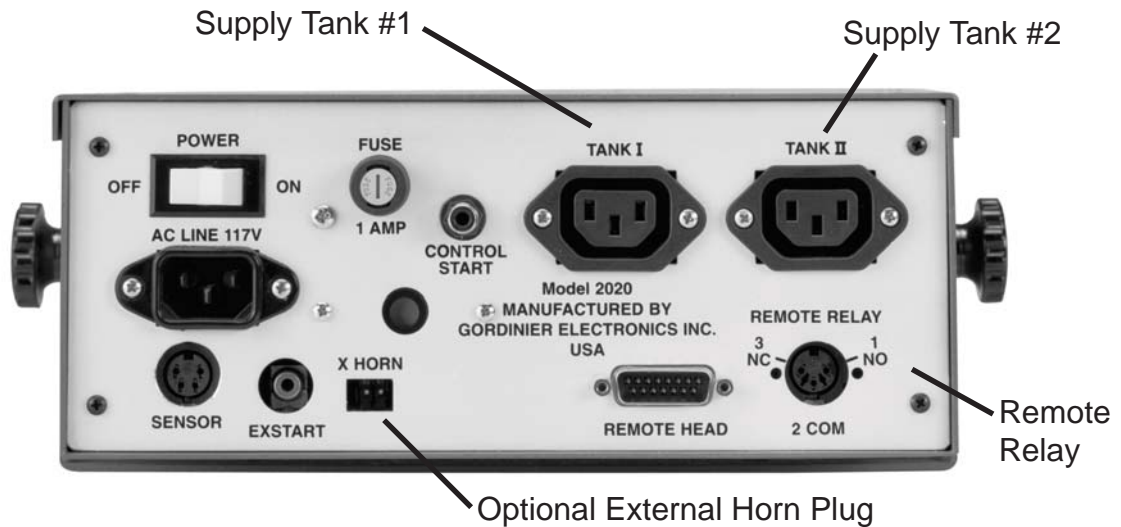
Remote Relay



Located at the rear of the controller are contact that are referred to as Dry Contacts, meaning no voltage is applied internally. The contact connections are marked, Common (number 2), “NC” normally closed (number 3), and “NO” normally open (number 1). These contacts are referred to when the 2020’s Power switch is in the off position. This condition constitutes an “Alarm Condition” and also represents the alarm condition for:

- A. Loss of power to the Model 2020 controller
- B. Both tanks are empty (Factory Setup) or by changing the switch setting, each tank, when empty, will trigger the remote relay.





Audible Horn Select

The audible horn may be selected for Tank #1 **OR** Tank #2 empty. The audible horn may be selected for Tank #1 **AND** Tank #2 empty.

See Page 18 for setup switch (SW-1) options.

Optional External Horn Plug

An audible horn, which can be plugged in and placed outside room or in hallway, has been provided for an optional horn, part #XH-4010.

Optional Remote Head

This output port connects to a remote user box, the Model 2011, providing complete front plate control of the system from a remote location.

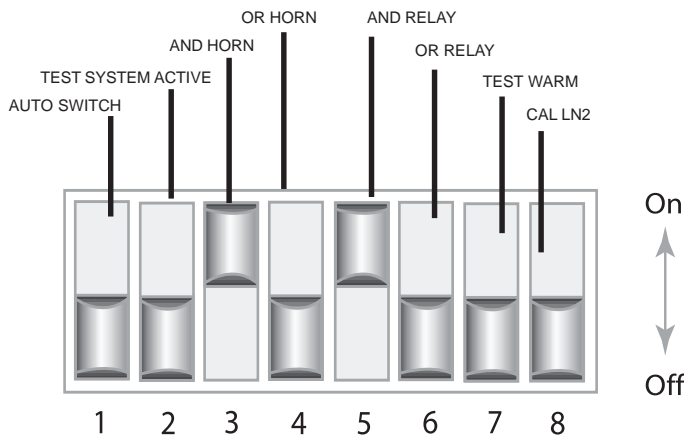


Model 2011

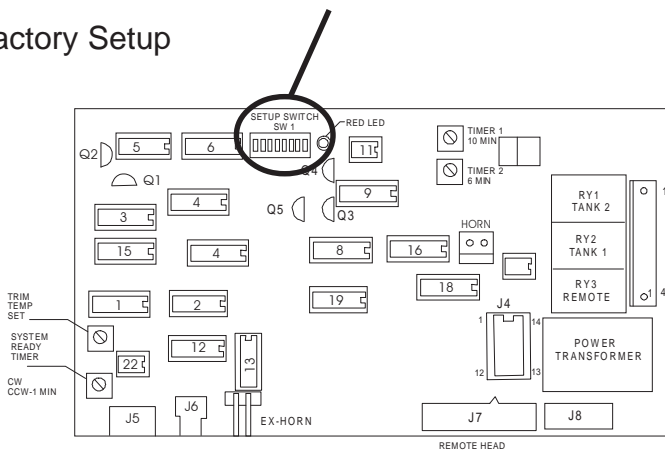
The Model 2011 remote head can be launched anywhere as long as the connecting cable is in place. A shielded 15 wire conductor cable is used to connect the remote head and 2020 controller. The 2011 remote head allows complete operation and monitoring of the 2020. The 2011 is useful in areas such as clean rooms and hallways where control as well as observation of switch over systems is required.

Installation

One end of the cable is prewired to the proper cable connection and the other end is simply connected to the screw terminals on the remote head.



Factory Setup



Switch #1
Auto Switch: Continuously hunts for full supply tank (See Switch #2)

Switch #2
System Active: Starts the controller, indicated by the lighting of the green System Active LED (See switch #1)

Switch #3
And Horn: Activates the audible horn when tank #1 and tank #2 are empty.

Switch #4
Or Horn: Activates the audible horn when tank #1 or tank #2 are empty.

Switch #5
And relay: Activates the remote relay when tank #1 and tank #2 are empty

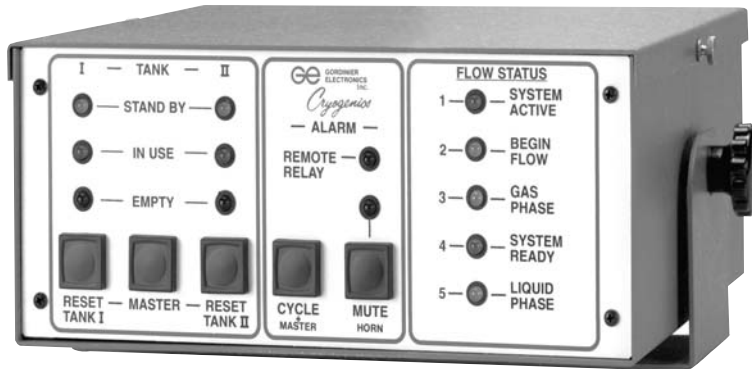
Switch #6
Or relay: Activates the remote relay when tank #1 or tank #2 are empty.

Switch #7
Test warm: (Unplug probe from controller) Simulates the sensor probe when it's out of liquid nitrogen and all the Probe Status LEDs are off

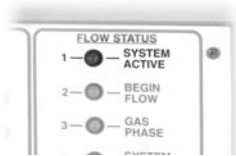
Switch #8
Cal LN2: (Unplug the probe from the controller) Adjust Temp Set trimmer until the green System Ready LED just comes on.

Remote Relay Select

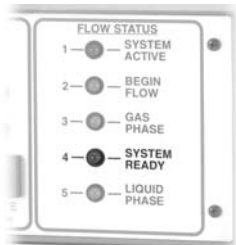
The 2020 controller allows the operator to select a remote relay alarm relay function for **one** tank empty or **both** tanks empty. The remote alarm relay may be selected for Tank #1 **OR** Tank #2 empty **OR** selected for Tank #1 AND Tank #2 empty. See **Diagram for setup switch (SW-1)**



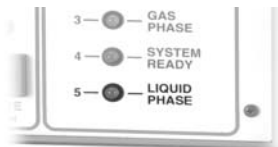
The system will start operating as soon as the Liquid Level Control Valve is activated via a converter box (Model 4027). Operation is indicated by the lighting of the green **System Active LED**, and can be tested by pressing the manual **Push To Start** button located on the level controller of the storage unit.



Pressing this button will cause both the storage unit and Tank #1 Solenoid Valve to be energized. Filling will start. Once filling begins, the built in five (5) minute timer will also start to allow time for the sensor to reach system ready temperature. This is indicated when the Flow Status, green **System Ready LED**, is lit.



*The final yellow **Liquid Phase LED** will light when the probe has fully reached the LN2 temperature. All of the **Flow Status LED** lights will remain lit until the supply tank empties. Once the supply tank is emptied the LED lights will go out starting with the yellow **Liquid Phase LED**. When the green System Ready LED goes out, the system will switch to the other supply tank.



At this point the second timer has already started allowing two (2) minutes for the probe temperature to cool down and turn the green **System Ready LED** on. This will stop the timer and allow the filling cycle to continue.

If at any time during the filling cycle the green **System Ready LED** hasn't lit, the unit will switch to the next tank. (See Timers page 5)

Resetting System After Empty Tank Replacement

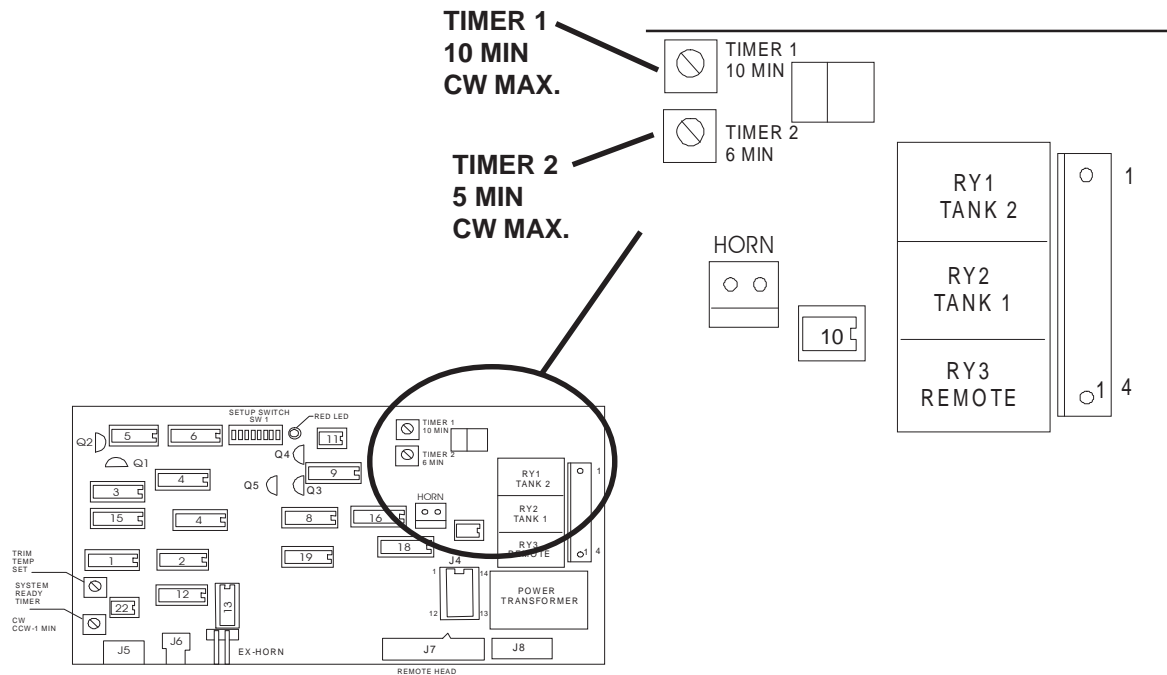
When a tank is empty the **Empty LED** will light. The system can only be reset by first pressing and holding the Master button while pressing the Reset buttons on the empty tank. At no time can reset be accomplished with just one button. Once the proper buttons are pressed, the yellow LED indicator will light. When both tanks have been reset, the Alarm LED will go out and the horn will stop sounding. (See Setup pg 9)

Muting Horn

Pressing the Mute button will turn on the red Mute LED and silence the horn during an alarm. After ten (10) minutes the horn will return and the red LED will go out. Pressing the Master button will also resound the alarm.

Tank Cycle Button

The Tank Cycle button is used together with the Master button. It allows the operator to manually cycle from one supply tank to another.



Timers One and Two Adjustment

The timers are located inside of the controller. To adjust them for a longer span, turn clockwise. Factory settings at approximately:
 10 minute timer #1 set for five (5) minutes
 5 minute timer #2 set for two (2) minutes
 See diagram above.

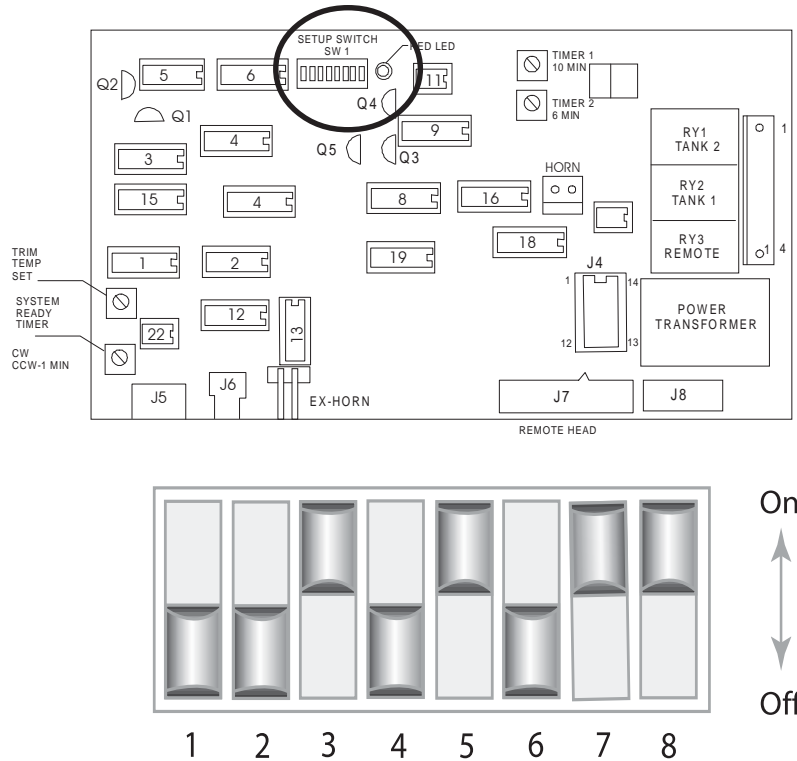
Auto Switching

Locate the selector switch on the circuit board, slide the switch number #1 to it's ON position.
 Operation: When both tanks are empty and in alarm for one and a half (1.5) minutes, the system will automatically switch back to tank #1 and the switching cycle will continue.

Simulating Tank Switching

Turn the supply Tank #1 manual valve off to simulate the tank being out of liquid. The system will switch to Tank #2. The Tank #1 red Empty LED will be lit, and the Tank #2 - green In Use LED will be lit.

To test Tank #2, turn supply Tank #2 manual valve off again. After two (2) minutes the controller will switch, but this time both red LEDs will be lit indicating an alarm condition. The audible horn will sound.



Calibration Adjustment

*Note:
Unplug the probe.

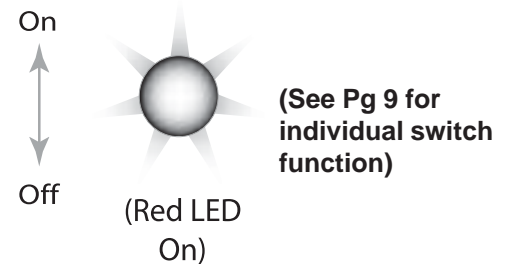
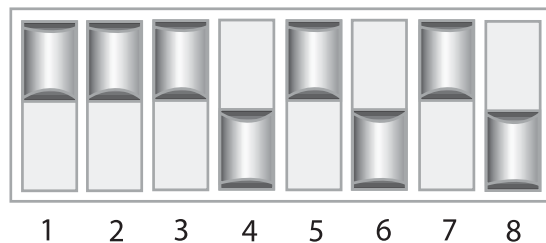
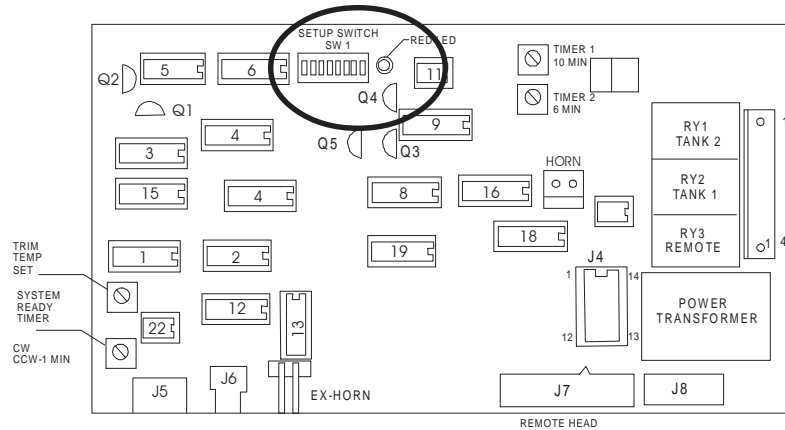
To calibrate the controller temperature switch point, ***DISCONNECT** the Sensor Probe from the rear and remove the cover of the 2020 controller. Locate the eight position selector switch and slide the #8 switch to the **ON** position. Locate the temperature trimmer and adjust it until the yellow **Liquid Phase** LED just comes on. Slide the #8 to the off position. (See page 9 temperature trimmer - trim temp. set).

Warning

Before attempting to wire, plug, or unplug any part of the storage system, make sure all plugs are removed from the Model 2020, storage tank and liquid level controllers. Consult an electrician or a qualified person when splicing into a valve cord set.

Sensor Plug

The sensor plug has a key-way and care should be taken when aligning the plug into the socket. After alignment, push the two together.



Bench Testing

Slide switch #2 to the **ON** position, turning on the green System Active LED. This switch also simulates the active call of LN2 from a storage unit.

Note:
Unplug the probe.

Auto switch mode

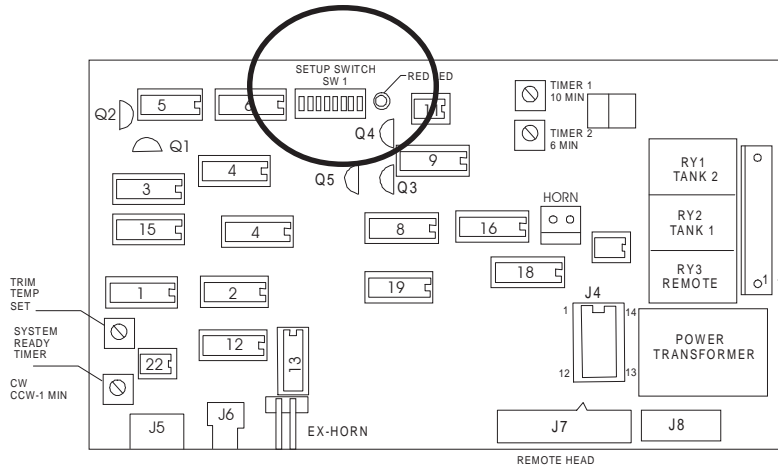
Slide switch #1 to the **ON** position, this will place the unit in an “auto switch cycle” mode. When both tanks are empty the system will switch back to Tank #1 after one minute of alarm.

Slide switch #7 to the **ON** position, this turns on the red LED next to the slide switch, and simulates the warm probe condition. All flow indicators will be off, except the green System Active LED, as you would expect on the first time cycle. At this point, the 2020 will go into its cycling mode.

Turning off the green System Active LED will stop the process. Turning off switch #7 will indicate the cooling of the sensor when the yellow Liquid Phase LED is lit and stop the auto cycling.

REMEMBER to return switch #2 and switch #7 to their **OFF** position.

See page 9 - set-up switch (SW-1)



System Active

Function:

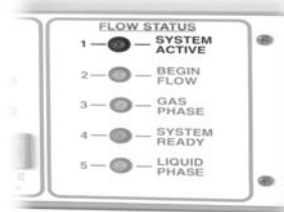
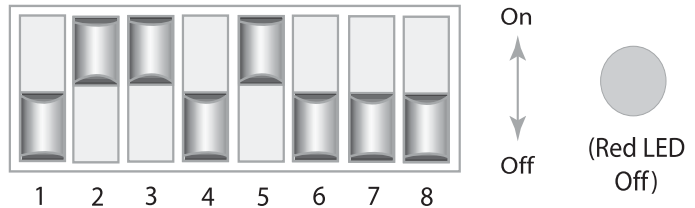
To simulate a storage unit calling for fill cycle.

What to do:

Slide SW1 switch #2 full up position.

Observe:

Green **system active** LED is lit.



Probe Function (Warm and Cold)

Function:

To simulate probe status function, unplug probe from 2020 and observe all probe status LED's are lit

What to do:

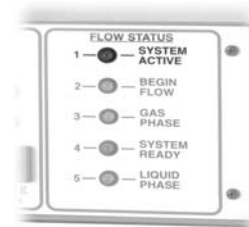
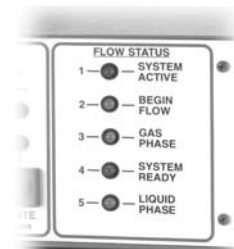
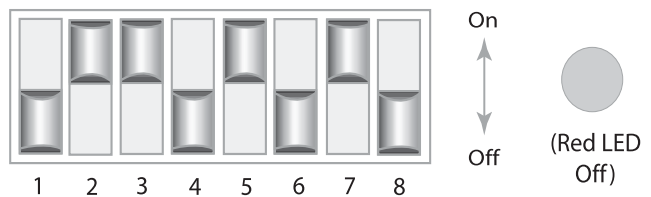
Slide SW1 switch #7 to its full up position

Observe:

All but the green **system active** LEDs will go out.

What to do:

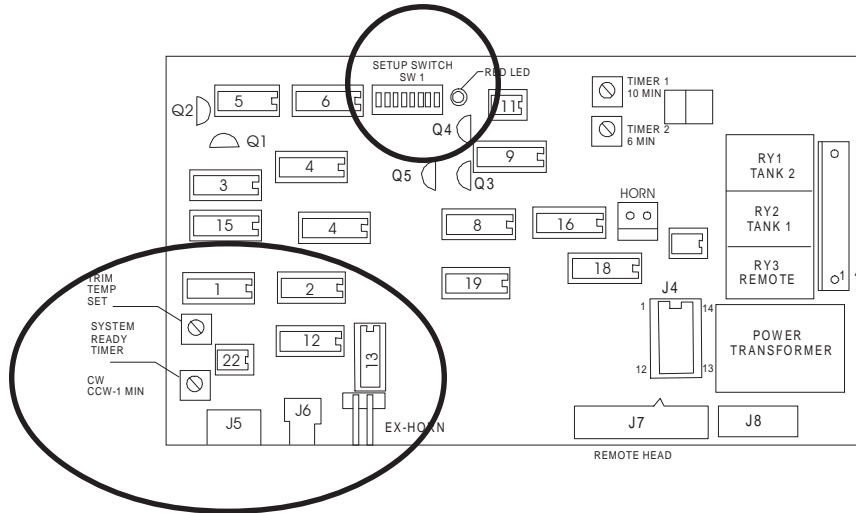
Allow the 2020 to remain in this mode (for five minutes) until tank #1 switches to empty. (After two and one half minutes for tank two)



All LED's Lit,
probe unplugged

Switch Mode
SW1 #7 on

Calibration of 2020 controller, slide SW1 switch



Calibration Setup

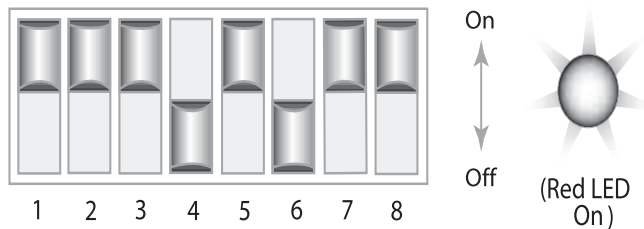
DISCONNECT PROBE

What to do:

With the **probe removed** from the 2020 controller, slide the SW1, SW2, SW3, SW5 and SW8 to their full up position. All others are down.

Observe:

The red LED next to the setup switch is lit and the green system active on the front plate is lit.

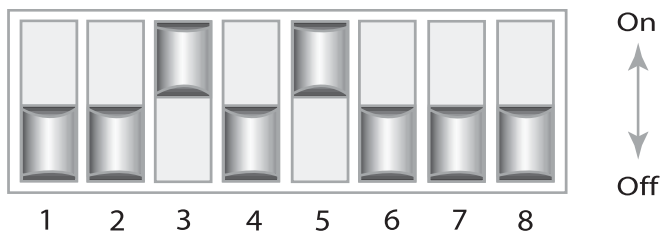
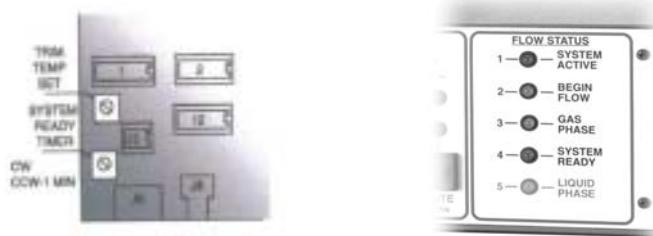


What to do:

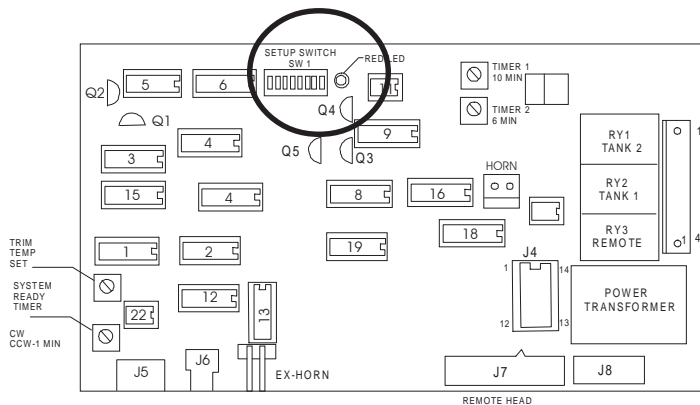
Using a small screwdriver, locate the temp set trimmer on the circuit board next to IC22.

Adjust --What to do:

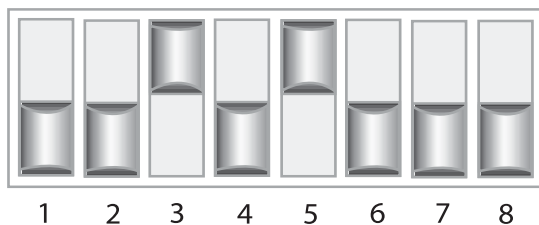
Slowly adjust this trimmer CW or CCW until the green system ready just comes on and may flicker off. Return switches to proper run mode and reconnect probe.



Factory Setting



Factory Setting



Switch #1
Auto Switch” Continuously hunts for full supply tank. (See switch #2)

Switch #2
System Active: Starts the controller, indicated by the lighting of the green System Active LED (See switch #1)

Switch #3
And Horn: Activates the audible horn when tank #1 and tank #2 are empty

Switch #4
Or Horn: Activates the audible horn when tank #1 or tank #2 are empty

Switch #5
And relay Activates the remote relay when tank #1 and tank #2 are empty

Switch #6
Or relay” Activates the remote relay when tank#1 or tank #2 are empty

Switch #7
Test warn: (Unplug probe from controller)
Simulates the sensor probe when it’s out of liquid nitrogen and all the Probe Status LEDs are off

Switch #8
Cal LN2; (Unplug the probe from the controller) Adjust Temp Set Trimmer until the green System Ready LED just comes on.

Horn: A setup switch is offered allowing the operator to select an audible horn for one tank empty **or** both tanks empty and:

Relay: A remote relay operation for one tank empty **or** both tanks empty. Factory setup is for both horn and relay for both tanks empty. (See setup switch pg. 9)

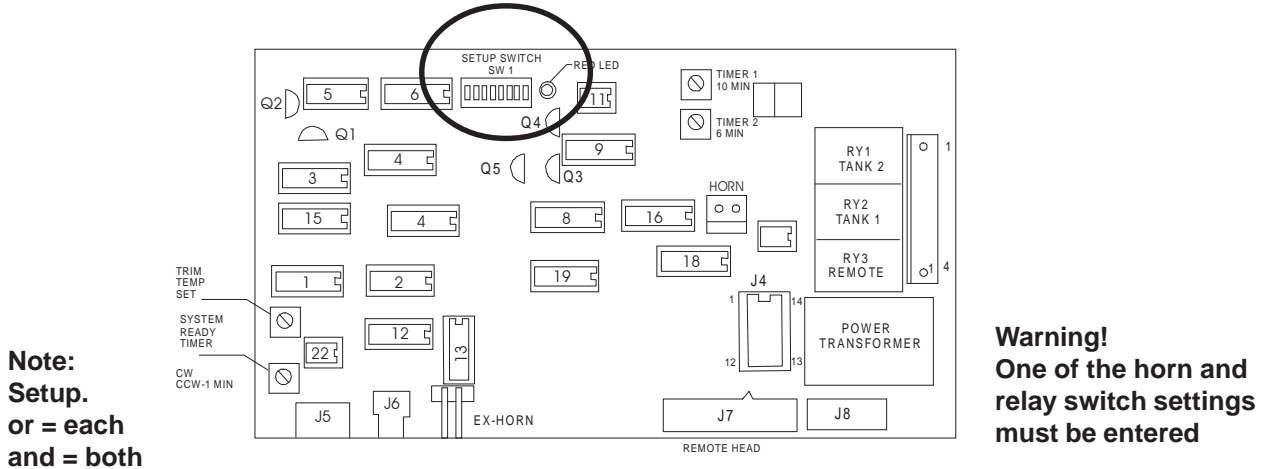
Auto Cycle: An additional setup switch can select an automatic cycle allowing the 2020 to hunt (cycle) for a usable supply tank. When both tanks are empty, the 2020 will continue cycling until one tank is replaced. Setup for this mode is both horn and relay for both tanks empty.

Note:
The 2020 will remain in an alarm condition (both tanks empty) for approximately 30 seconds before switching to its tank one and tank two in standby mode.

Model 2020

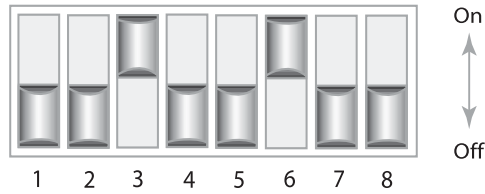
Bench Testing, Horn and Remote Relay

Horn and Remote Relay Setup



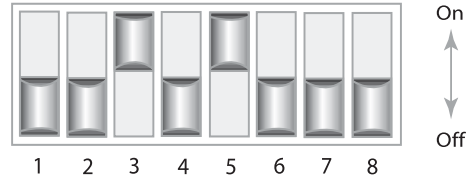
Horn when each tank empties:

Relay when each tank empties:



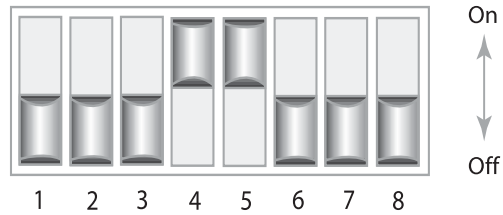
Horn when both tanks are empty:

Relay when each tank empties:



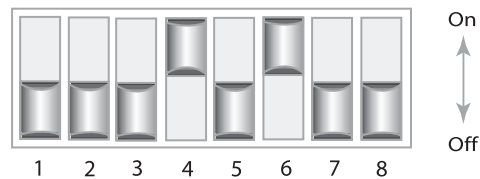
Horn when each tank empties:

Relay when both tanks are empty:



Horn when both tanks are empty:

Relay when both tanks are empty:



Factory Setting