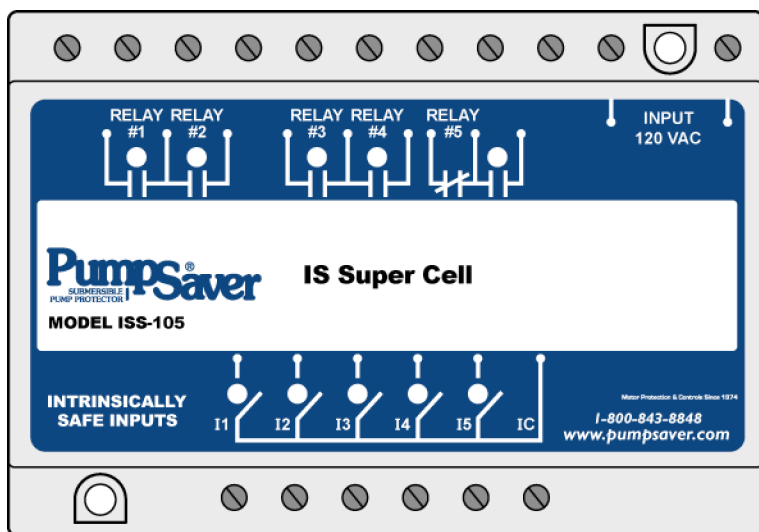


PumpSaver® ISS-105

IS Super Cell

Installation Guide



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II-ISS-105-B



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Introduction

The PumpSaver® ISS-105 IS Super Cell is a smart, five-channel, intrinsically safe relay and pump controller. It has a long list of features that are needed for multiple pump applications. The IS Super Cell can indicate low, high and out-of-sequence alarms. It can do alternating pump control, non-alternating pump control, or alternating control with one non-alternating pump. The non-alternating pump can be used as either a jockey or emergency pump and can optionally start the non-alternating pump after every 50 cycles of the lead pump, to keep it working freely. Using the built-in DIP switches, individual pumps can be disabled when taken out of service for repair or maintenance.

The IS Super Cell has the following features and capabilities:

- 4 High, Low and Out-Of-Sequence Alarms
- 4 Variable Time Delay/Lag Pump Delay
- 4 Separate Pump Stop
- 4 Pump Alternation w/ or w/o Non-Alternating Pump
- 4 Jockey or Emergency Pump
- 4 Duplex, Triplex or Quadplex Pump Modes
- 4 Pump Up or Pump Down Functions
- 4 External Silence, Reset and Alternation Configuration
- 4 Five-Channel Relay

Quick Start

The IS Super Cell can operate as an intrinsically safe pump control for eight different pumping configurations. Duplex, Triplex, Quadplex and Duplex SPS (Separate Pump Stop) pumping modes are possible for either Pump Up or Pump Down applications. Refer to page 21 for the full description of five-channel relay operation.

Read **1. Pumping Modes**, page 6, for details of the features and mode descriptions of the unit.

1. If the desired pump configuration is known, follow Table 1 to the page showing the typical wiring diagram and setup for each mode.
2. If further description is needed in choosing which mode to use, see Table 2 and Table 3 to view the capabilities of each pumping mode and look at the typical wiring diagrams of the eight different pumping modes starting on page 11.
3. Once the desired configuration is determined, punch out and slide the correct card into the slot on the front of the IS Super Cell to display the input and output connections.

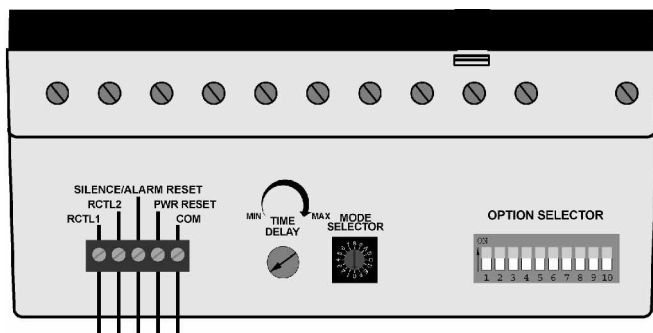
Mode Selector Switch Position	Mode Description	Page
0	5-Channel Relay – Mode 0	22
1	Duplex Pump Down – Mode 1	11
2	Triplex Pump Down – Mode 2	12
3	Quadplex Pump Down – Mode 3	13
4	Duplex SPS Pump Down – Mode 4	14
5	Duplex Pump Up – Mode 5	15
6	Triplex Pump Up – Mode 6	16
7	Quadplex Pump Up – Mode 7	17
8	Duplex SPS Pump Up – Mode 8	18

Table 1. Mode Selector

Model Description

The ISS-105 has three adjustable controls to set the mode of operation:

1. Mode Selector
2. Option Selector
3. Time Delay



WARNING!

To ensure proper initialization and operation, set the mode and option selectors before applying power to the unit.

Time Delay

The Time Delay can be set from 2–255 seconds and is the Lag Pump delay in each of the pumping modes. When the Lead Float opens/closes, the Time Delay starts and once it expires, the Lag Pump is ready to turn on. After the Lag Pump turns on, any necessary pumps will turn on successively after a two-second time delay each.

Mode Selector

This dial is used to select the operation mode. A description of each mode is shown in Table 1. The capabilities of each pumping mode and the Non-Alternating Pump designations are shown in Table 2 below.

	Duplex	Triplex	Quadplex	Duplex SPS
# Pumps	2	3	4	2
High Alarm	Yes	*Yes	No	**Yes
Low Alarm	Yes	*Yes	No	**Yes
Out-of-Sequence Alarm	Yes	Yes	Yes	Yes
# Stop Floats	1	1	1	2
Pump Direction	Up/Down	Up/Down	Up/Down	Up/Down
Non-Alternating Start Float	Lag 1	Lag 2	Lag 3	N/A
Non-Alternation Pump	Pump 2	Pump 3	Pump 4	N/A
Alternator	Yes	Yes	Yes	Yes

Table 2. Mode Capabilities

* On a Triplex pump system, either a High or Low Alarm is available, but not both. See Triplex Mode description for more details.

** On a Duplex SPS system, a High Alarm is typical on a Pump Down application and a Low Alarm is typical on a Pump Up.

Option Selector

Table 2 describes the Option Selector for all pumping modes.

(· Indicates the function is available for the pump mode)

Option Selector Position	Function Description	Duplex	Triplex	Quadplex	Duplex SPS (Separate Pump Stop)
1	High Alarm	·	* ·		·
2	Low Alarm	·	* ·		·
3	Pump 1	·	·	·	·
4	Pump 2	·	·	·	·
5	Pump 3		·	·	
6	Pump 4			·	
7	Audible Alarm Relay State/Fail Safe	·	·	·	·
8	Alternator Select 0, (ALS-0, see Table 4)	·	·	·	·
9	Alternator Select 1, (ALS-1, see Table 4)	·	·	·	·
10	Alternator Select 2, (ALS-2, see Table 4)	·	·	·	·

Table 3. Option Selector

* On a Triplex pump system, either a High or Low Alarm is available, but not both. See Triplex Mode description for more details.

1. Pumping Modes

Duplex

In a Duplex mode, two pumps are used with one Stop Float and High and Low Alarms.

Triplex: High/Low Alarm

In a Triplex mode, three pumps are used with one Stop Float.

In a **Triplex Pump Down** mode, a High Alarm is the typical configuration with the Option Selector switches 1=ON (High Alarm) and 2=OFF (Low Alarm).

If a Low Alarm is desired, the alarm float must be moved to the position in the tank below the Stop Float and Option Selector switches must be 1=OFF and 2=ON.

In a **Triplex Pump Up** mode, a Low Alarm is the typical configuration with the Option Selector switches 1=OFF (High Alarm) and 2=ON (Low Alarm).

If a High Alarm is desired, the alarm float must be moved to the position in the tank above the Stop Float and Option Selector switches must be 1=ON and 2=OFF

Quadplex

In a Quadplex mode, four pumps are used with one Stop Float and no alarms floats.

Separate Pump Stop (SPS)

In the Duplex SPS mode, both the Lead and Lag pumps have their own stop floats.

In an **SPS Pump Down** mode, a **High Alarm** is the typical configuration with Option Selector switches 1=ON (High Alarm) and 2=OFF (Low Alarm).

If a **Low Alarm** is desired, the alarm float must be moved to the position in the tank below the Lead Stop Float, and Option Selector switches must be 1=OFF, and 2=ON.

In an **SPS Pump Up** mode, a **Low Alarm** is the typical configuration with Option Selector switches 1=OFF (High Alarm) and 2=ON (Low Alarm).

If a **High Alarm** is desired, the alarm float must be moved to the position in the tank above the Lead Stop Float, and Option Selector switches must be 1=ON and 2=OFF.

2. IS Super Cell Functions

High Alarm

The **High Alarm** is activated when the High Alarm Float closes, indicating the pumps are unable to keep the water level down on a **Pump Down** application. If the High Alarm Float closes at any time, all pumps will turn on, bypassing the 10-second out-of-sequence trip delay, and the adjustable Time Delay.

If a **High Alarm** is used on a **Pump Up** application, the alarm will be activated when the High Alarm Float closes indicating the water level has been pumped too high, possibly due to a defective Stop Float, and will turn off all pumps.

During a High or Low Alarm, the Alarm LED and Audible Alarm LED will be on. If the High or Low Alarm condition ends, the Audible Alarm will turn off and the Alarm LED will flash indicating the alarm had occurred, but is not present now. If the High or Low Alarm occurs again, the Audible Alarm LED will turn on again, but the Alarm LED will remain flashing.

The unit must be silenced or reset to clear the flashing alarm LEDs.

Low Alarm

The **Low Alarm** is activated when the Low Alarm Float opens indicating the pumps are unable to keep the water level up on a **Pump Up** application. If the Pump Up Low Alarm Float opens at any time, except if a High Alarm is activated, all pumps will turn on.

If a **Low Alarm** is used on a **Pump Down** application, the alarm will be activated when the Low Alarm Float opens indicating the water level has been pumped too low. This may be a result of a defective stop float. The Low Alarm will not turn off the pumps though, but will activate the low alarm relay; another form of pump-dry protection such as the SymCom Model 777 may be required.

Out-of-Sequence Alarm

When a float in the series does not open or close in sequence, the Audible Alarm will be activated and input LED(s) will flash until the unit

is reset or power is cycled. An out-of-sequence condition has to exist for 10 seconds before the ISS-105 will alarm. When the stop float fails open in pump down mode or closed in pump up mode, an Out-of-Sequence Alarm will NOT occur and pumps will not turn on with floats. In this case, all pumps will turn on when the High/Low Alarm is activated. Thus, in Quadplex mode, pumps will never turn on if the Stop Float malfunctions.

Audible Alarm

The Audible Alarm is activated when a High, Low or Out-of Sequence Alarm occurs. The Audible Alarm will turn off when there is no longer high or low alarms or if the unit is silenced.

Audible Alarm Logic/Fail-Safe

The Audible Alarm relay can be configured to operate in either a Fail-Safe mode (position 7=ON), or a Non Fail-Safe mode (position 7=OFF). In Fail-Safe mode, the NC (Normally Closed) contacts will be **open** during normal operation and **closed** during an alarm. In Non Fail-Safe mode, the NC contacts will be **closed** during normal operation and open during an alarm.

Clearing Alarms

The external Silence / Alarm Reset button will clear the Audible Alarm. The Reset button or cycling power will clear Out-of-Sequence Alarms.

Alternation

The ISS-105 is equipped with a built-in alternator that determines which pump will start each pumping cycle. This alternator is configured using switches ALS-0, ALS-1 and ALS-2 of the Option Selector.

Function	ALS-0 Position 8	ALS-1 Position 9	ALS-2 Position 10
Alternation On	ON	ON	ON
Alternation On	OFF	ON	ON
Alternation On, Non-Alternating Pump Enabled (1)	*ON	OFF	OFF
Alternation On, Non-Alternating Pump Enabled (1)	**OFF	OFF	OFF
Alternation Off, Force Pump 1 as Lead	OFF	ON	OFF
Alternation Off, Force Pump 2 as Lead	OFF	OFF	ON
Alternation Off, Force Pump 3 as Lead (2)	ON	ON	OFF
Alternation Off, Force Pump 4 as Lead (3)	ON	OFF	ON

Table 4. Alternator Options

Note (1) In Duplex Mode, this setting is the same as Alternation On.

Note (2) In Duplex Mode, this will force Pump 1 as lead and will cycle Pump 2 every 50 cycles of the lead pump

Note (3) In Duplex Mode, this will force Pump 2 as lead and will cycle Pump 1 every 50 cycles of the lead pump

* If ALS-0 is ON in this mode, the Non-Alternating Pump will cycle when the Non-Alternating Float changes state, or after 50 cycles of the Lead Float.

** If ALS-0 is OFF the Non-Alternating Pump will cycle only when the Non-Alternating Float changes state.

Alternation On

When the alternator is on, each pump will be alternated as the Lead Pump (see Table 5).

	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5
Pump 1	Lead	Lag 3	Lag 2	Lag 1	Lead
Pump 2	Lag 1	Lead	Lag 3	Lag 2	Lag 1
Pump 3	Lag 2	Lag 1	Lead	Lag 3	Lag 2
Pump 4	Lag 3	Lag 2	Lag 1	Lead	Lag 3

Table 5. Pump Sequence

Alternation On, Non-Alternating Pump Enabled

The Triplex and Quadplex pump modes are equipped with an optional Non-Alternating Pump. This pump will **not** be included in the normal pump alternation sequence when ALS-1 and ALS-2 (positions 9 and 10) are both OFF. If ALS-0 (position 8) is ON, the Non-Alternating Pump will cycle when the Non-Alternating Float changes state or after every 50 cycles of the Lead Float. If ALS-0 is OFF, the Non-Alternating Pump will only cycle if the Non-Alternating Float changes state.

The last pump in the float sequence (highest #) is the Non-Alternating Pump and can be used as either a jockey or emergency pump. (See Table 2, page 5 for Non-Alternating Pump and Float details for each pumping mode.)

A **Jockey Pump** is typically a smaller pump that will always be used first in the pump sequence. In order to implement a jockey pump; the Non-Alternating Pump Float must be moved in the tank to just above the Stop Float in a Pump Down system, and to just below the Stop Float in a Pump Up system. See Figure 9 (page 19), an example wiring diagram using a Jockey Pump in a Duplex Pump Down system.

An **Emergency Pump** is usually a larger pump that is always used last. In order to implement an emergency pump; the Non-Alternating Pump is already the last pump in the sequence so there is no need to move the float. See Figure 10 (page 20), an example wiring diagram using an Emergency Pump in a Duplex Pump Down system.

Alternation Off

When the alternator is off, a Lead Pump can be forced by setting ALS-0, 1 & 2 (see Table 4). The remaining pumps will start in a sequential order as each float opens/closes.

Disabling Pumps

Using the built-in DIP switches, individual pumps can be disabled, when taken out of service for repair or maintenance.

WARNING !

UNEXPECTED OUTPUT ACTUATION CAN OCCUR.

Use hard-wired safety interlocks where personnel and/or equipment hazards exist.
Failure to follow this instruction can result in death, injury or equipment damage.

External Inputs

A five-pin connector is provided for optional external inputs.

- **External Silence / Alarm Reset**

This input allows for an external NO (Normally Open) pushbutton that will silence audible alarms and clear flashing alarm lights.

- **External Power Reset**

This input allows for an external NO pushbutton to reset the IS Super Cell, causing the same effect as a power cycle.

- **External Alternation Configuration**

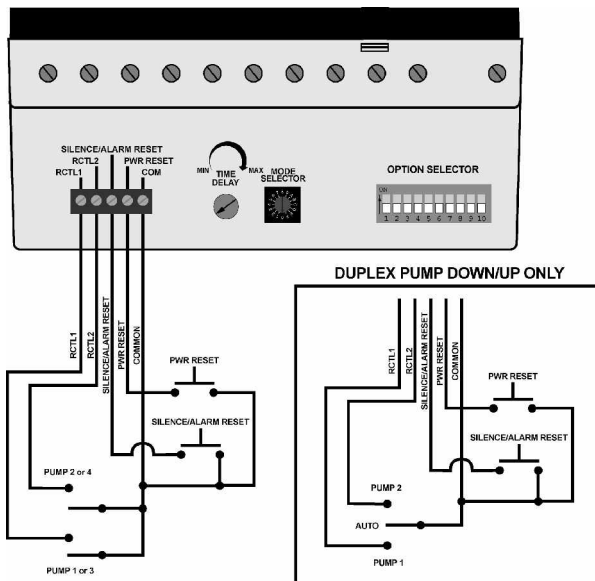
For Duplex Mode, a SPDT (Single Pole Double Throw) switch can be connected to close RTCL1 or RTCL2 (remote controls) to force Pump 1 or 2 as the Lead Pump. **Option Selector Positions 8, 9 & 10 must be OFF.** If the switch is in the middle position, pumps will be in alternation mode.

For Triplex and Quadplex Modes two SPST (Single Pole Single Throw) switches can be connected to force Pump 1,2,3 or 4 to be the Lead Pump. **Option Selector Positions 9 & 10 must be OFF.**

To force Pump 1 or 2 as Lead, **Position 8 must be OFF.**

To force Pump 3 or 4 as Lead, **Position 8 must be ON.**

For alternation mode, close both RTCL1 and RTCL2.



3. Wiring Diagrams

The following Figures 1-10, show typical wiring diagrams for all pumping modes available for the IS Super Cell.

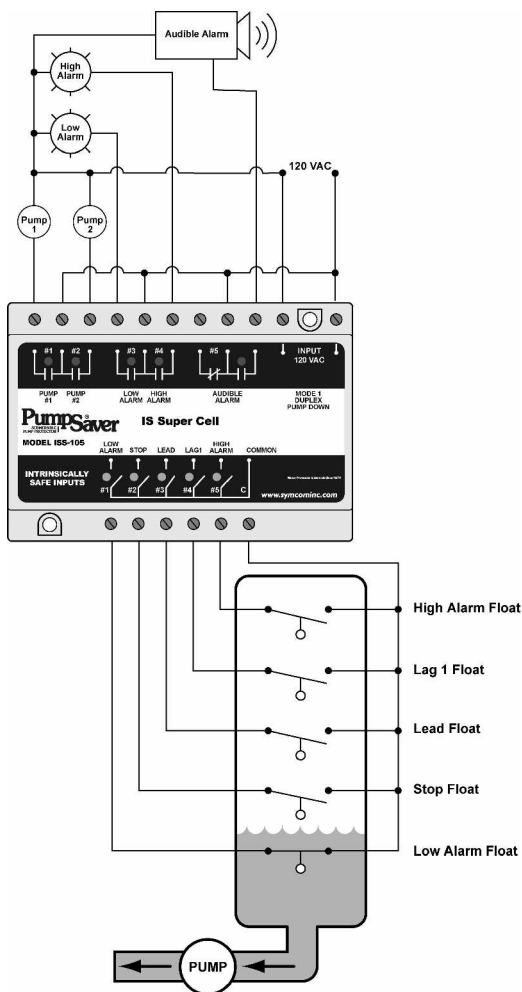


Figure 1. Typical Wiring for Duplex Pump Down - Mode 1

		Switch State
Mode Selector Switch		1
Time Delay Adjustment		MIN
Option Selector Switch		
1	High Alarm	ON
2	Low Alarm	ON
3	Pump 1	ON
4	Pump 2	ON
5	Pump 3	NA
6	Pump 4	NA
7	Fail-Safe	OFF
8	ALS-0	ON
9	ALS-1	ON
10	ALS-2	ON

Table 6. Typical Duplex Pump Down Setup

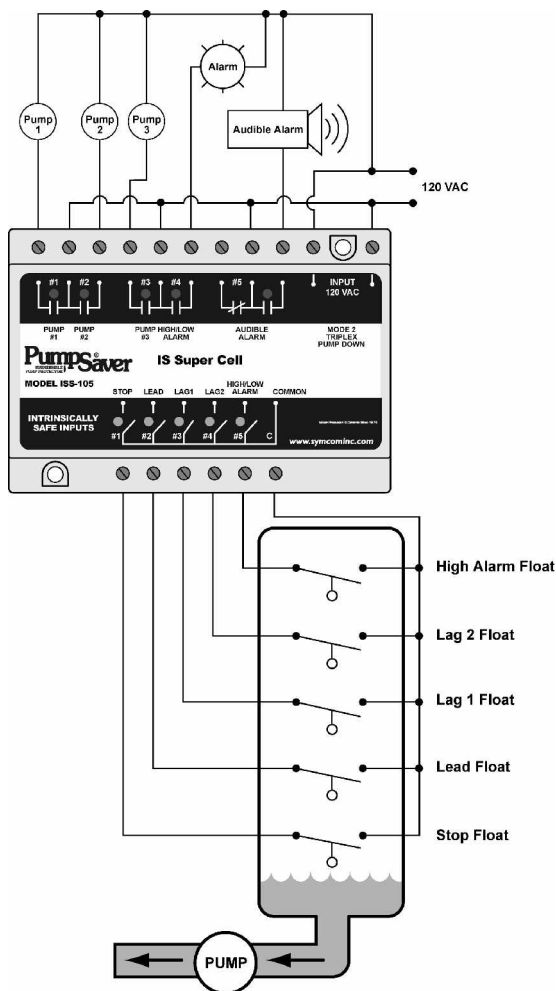


Figure 2. Typical Wiring for Triplex Pump Down - Mode 2

		Switch State
Mode Selector Switch		2
Time Delay Adjustment		MIN
Option Selector Switch		
1	High Alarm	ON
2	Low Alarm	OFF
3	Pump 1	ON
4	Pump 2	ON
5	Pump 3	ON
6	Pump 4	NA
7	Fail-Safe	OFF
8	ALS-0	ON
9	ALS-1	ON
10	ALS-2	ON

Table 7. Typical Triplex Pump Down Setup

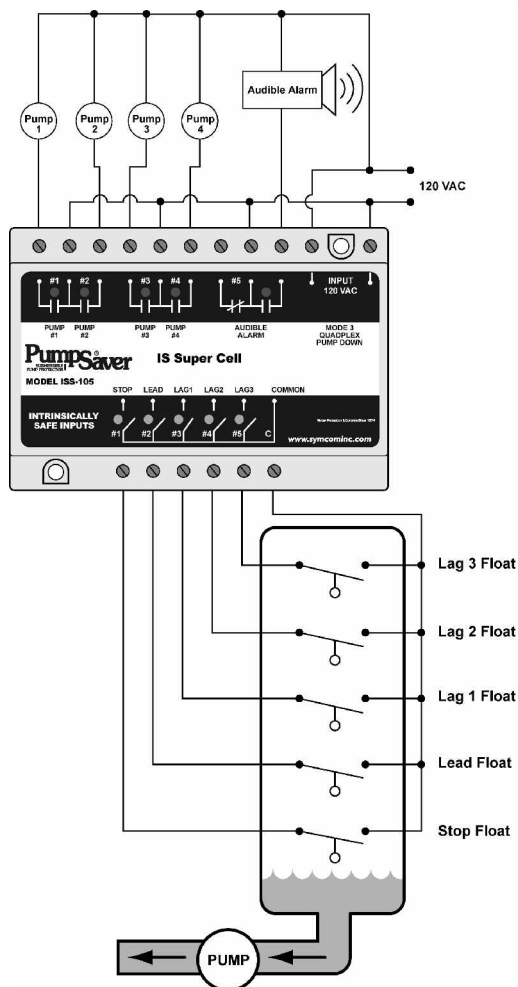


Figure 3. Typical Wiring for Quadplex Pump Down - Mode 3

		Switch State
Mode Selector Switch		3
Time Delay Adjustment		MIN
Option Selector Switch		
1	High Alarm	NA
2	Low Alarm	NA
3	Pump 1	ON
4	Pump 2	ON
5	Pump 3	ON
6	Pump 4	ON
7	Fail-Safe	OFF
8	ALS-0	ON
9	ALS-1	ON
10	ALS-2	ON

Table 8. Typical Quadplex Pump Down Setup



Table 9. Typical Duplex SPS Pump Down Setup

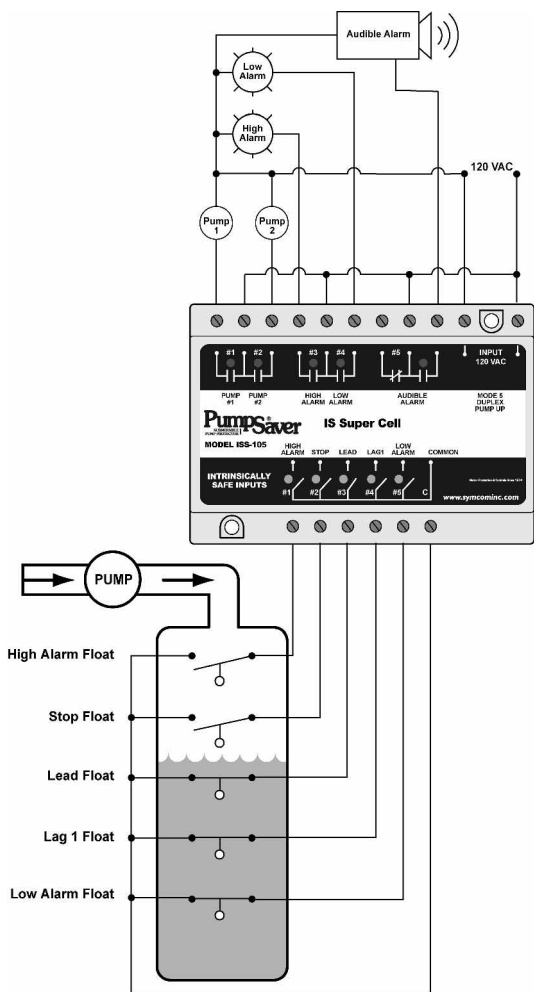


Figure 5. Typical Wiring for Duplex Pump Up - Mode 5

		Switch State
Mode Selector Switch		5
Time Delay Adjustment		MIN
Option Selector Switch		
1	High Alarm	ON
2	Low Alarm	ON
3	Pump 1	ON
4	Pump 2	ON
5	Pump 3	NA
6	Pump 4	NA
7	Fail-Safe	OFF
8	ALS-0	ON
9	ALS-1	ON
10	ALS-2	ON

Table 10. Typical Duplex Pump Up Setup

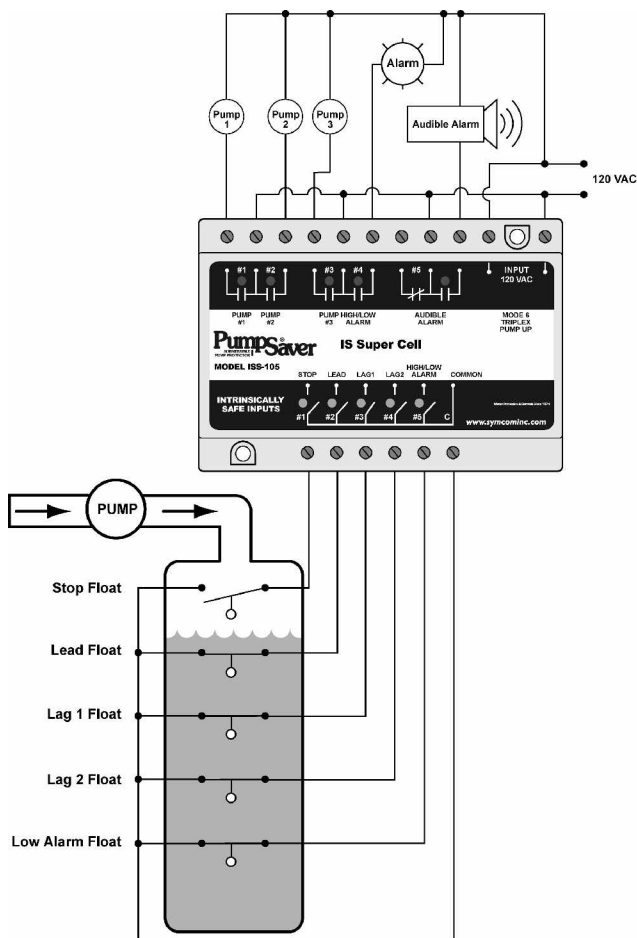


Figure 6. Typical Wiring for Triplex Pump Up - Mode 6

		Switch State
Mode Selector Switch		6
Time Delay Adjustment		MIN
Option Selector Switch		
1	High Alarm	OFF
2	Low Alarm	ON
3	Pump 1	ON
4	Pump 2	ON
5	Pump 3	ON
6	Pump 4	NA
7	Fail-Safe	OFF
8	ALS-0	ON
9	ALS-1	ON
10	ALS-2	ON

Table 11. Typical Triplex Pump Up Setup

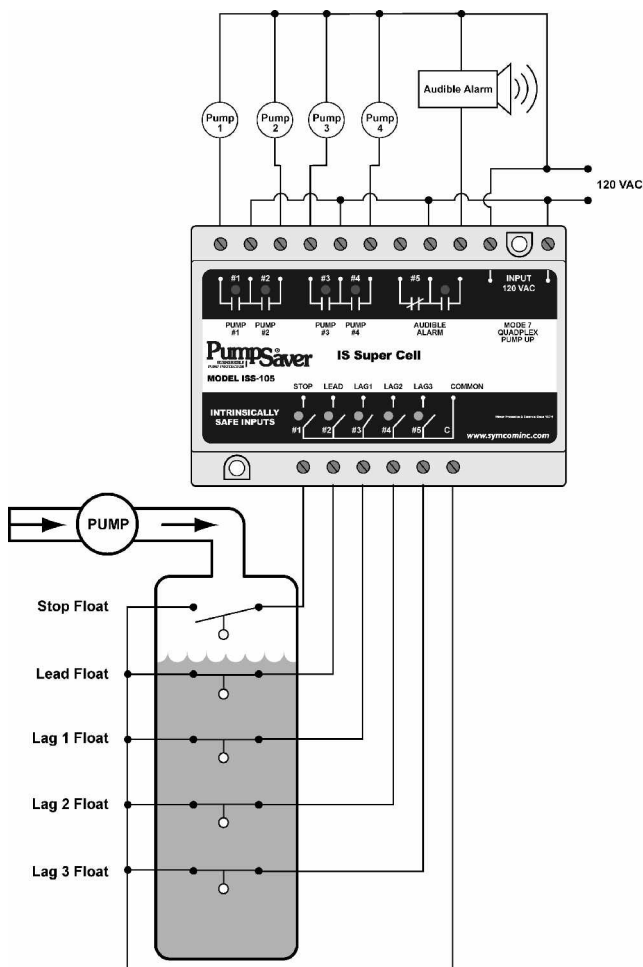


Figure 7. Typical Wiring for Quadplex Pump Up - Mode 7

Mode Selector Switch		7
Time Delay Adjustment		MIN
Option Selector Switch		
1	High Alarm	NA
2	Low Alarm	NA
3	Pump 1	ON
4	Pump 2	ON
5	Pump 3	ON
6	Pump 4	ON
7	Fail-Safe	OFF
8	ALS-0	ON
9	ALS-1	ON
10	ALS-2	ON

Table 12. Typical Quadplex Pump Up Setup

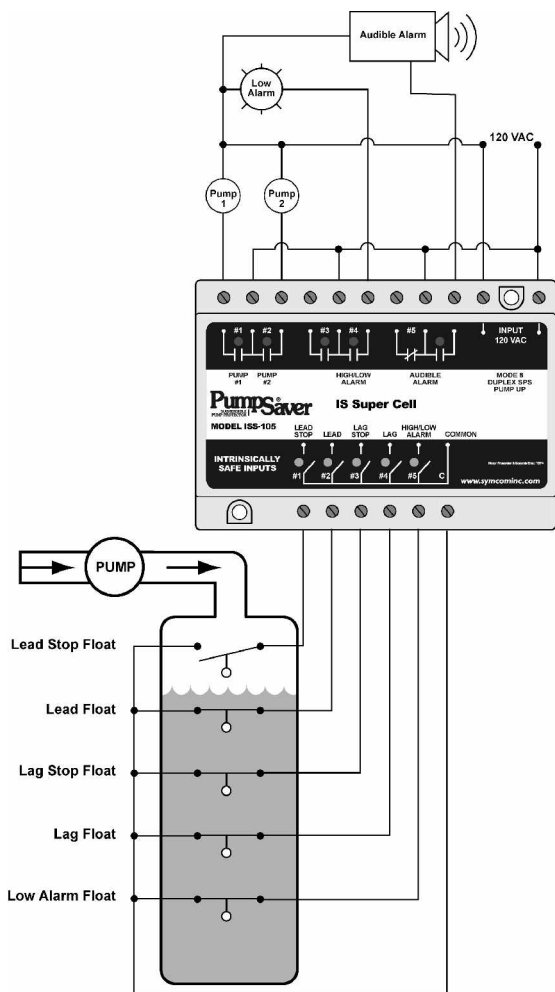


Figure 8. Typical Wiring for Duplex SPS Pump Up - Mode 8

		Switch State
Mode Selector Switch		8
Time Delay Adjustment		MIN
Option Selector Switch		
1	High Alarm	OFF
2	Low Alarm	ON
3	Pump 1	ON
4	Pump 2	ON
5	Pump 3	NA
6	Pump 4	NA
7	Fail-Safe	OFF
8	ALS-0	ON
9	ALS-1	ON
10	ALS-2	ON

Table 13. Typical Duplex SPS Pump Up Setup

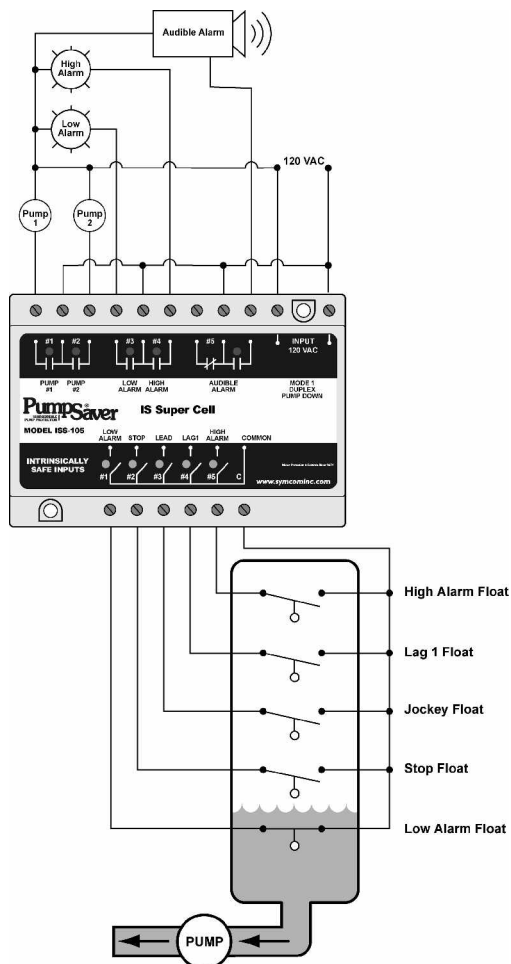


Figure 9. Typical Wiring for Duplex Pump Down with a Jockey Pump - Mode 1

		Switch State
Mode Selector Switch		1
Time Delay Adjustment		MIN
Option Selector Switch		
1	High Alarm	ON
2	Low Alarm	ON
3	Pump 1	ON
4	Pump 2	ON
5	Pump 3	NA
6	Pump 4	NA
7	Fail-Safe	OFF
8	ALS-0	OFF
9	ALS-1	ON
10	ALS-2	OFF

Table 14. Typical Duplex Pump Down w/ Jockey Setup

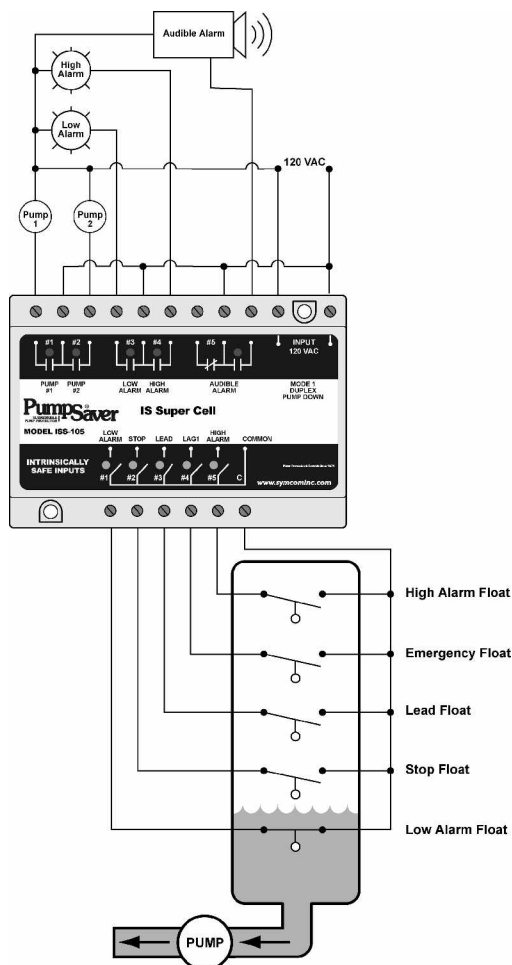


Figure 10. Typical Wiring for Duplex Pump Down with an Emergency Pump - Mode 1

		Switch State
Mode Selector Switch		1
Time Delay Adjustment		MIN
Option Selector Switch		
1	High Alarm	ON
2	Low Alarm	ON
3	Pump 1	ON
4	Pump 2	ON
5	Pump 3	NA
6	Pump 4	NA
7	Fail-Safe	OFF
8	ALS-0	OFF
9	ALS-1	OFF
10	ALS-2	ON

Table 15. Typical Duplex Pump Down Setup

4. Five-Channel Relay Mode

Some unique features of the Five-Channel Relay mode are described below. **To use the IS Super Cell in this mode, the Mode Selector dial must be set to position 0.**

Option Selector Position	Function Description	ON Function	OFF Function
1	Enables Channel 2 Latch	Channel 1 and 2 function normally	Channel 1 Latches Channel 2
2	Enables Channel 4 Latch	Channel 3 and 4 function normally	Channel 3 Latches Channel 4
3	Relay 1 Logic	Positive	Negative
4	Relay 2 Logic	Positive	Negative
5	Relay 3 Logic	Positive	Negative
6	Relay 4 Logic	Positive	Negative
7	Relay 5 Logic	Positive	Negative
8	Selects Make/Break	Delay-On-Break	Delay-On-Make
9	Enables Delay-On-Make/Break Timer	Make/Break Timer Disabled	Make/Break Timer Enabled
10	Not Used	-----	-----

Table 16. Five-Channel Relay Options

Positive/Negative Logic

Using **positive logic** will give the same output as input – if the input is closed, the corresponding output relay will also be closed.

If using **negative logic**, the output will be the opposite of the input – if the input is closed, the output relay will be open.

Latched Output

Relays 2 and 4 can be configured as latched relays. Input 2 will cause relay 2 to close, but this relay will not open until input 1 opens. Relay 4 will close when input 4 closes, but will not open until input 3 opens.

Time Delay Output

Relay 5 can be configured as a Delay-On-Make or a Delay-On-Break time delay output. All timing starts when the input switch opens or closes. The time base for this output is adjustable using the Time Delay knob and ranges from 2-255 seconds.

• Delay-On-Make

If Input 5 closes, the Time Delay will start and LED 5 will flash. Once the Time Delay has expired, Output Relay 5 will close and the LED will be on. If Input 5 opens at any point during the timing cycle, the Time Delay stops and Output Relay 5 remains open.

• Delay-On-Break

If Input 5 opens, the Time Delay will start and LED 5 will flash. Once the Time Delay has expired, Output Relay 5 will open and the LED will be off. If Input 5 closes at any point during the timing cycle, the Time Delay stops and Output Relay 5 remains closed.

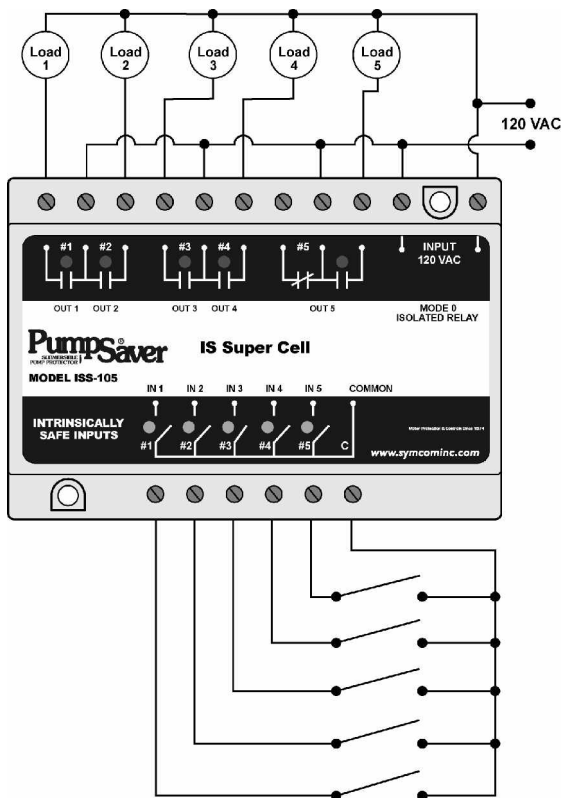


Figure 11. Typical Wiring for 5-channel Relay - Mode 0

Model ISS-105 Specifications	
Control Voltage	108–132VAC
Frequency	50/60 Hz
Power	4 Watts (max.)
Adjustments	
Time Delay/Lag Pump Delay	2–255 sec.
Mode Selector	0–8 (9–F: force mode 0)
Option Selector	1–10, ON/OFF
Silence Button	dry input only / non IS
Reset Button	dry input only / non IS
External Alternation Configuration	ALS-1
External Alternation Configuration	ALS-2
Pumping Modes Available	
Duplex Pump Down	2 pumps w/ high and low alarms
Triplex Pump Down	3 pumps w/ high alarm (typical)
Quadplex Pump Down	4 pumps
Duplex Pump Down SPS (Separate Pump Stop)	2 pumps w/ high alarm (typical) 2 stop floats
Duplex Pump Up	2 pumps w/ high and low alarms
Triplex Pump Up	3 pumps w/ low alarm (typical)
Quadplex Pump Up	4 pumps
Duplex Pump Up SPS (Separate Pump Stop)	2 pumps w/ low alarm (typical) 2 stop floats
5-Channel Relay Mode	
5-Channel	1 relay latched / time delay output
Operating Temperature	-20 to 55°C
Terminals	
Wire AWG	12–20 AWG
Torque	6 in.-lbs.
Relay Contacts	
	B 300 or 480VA @ 240VAC, Pilot Duty
	240 VAC, 7A (max.), General Purpose
Pump Inrush Delay	2 sec.
Entity Parameters	
	Voc=16.8 V
	Isc=1.2 mA
	La=100mH
	Ca=0.39μF
	$P_o = \frac{V_{oc} * I_{sc}}{4}$
Provides Intrinsically Safe Circuits in the Following Locations:	Class I, Divisions I & II, Groups A, B, C & D; Class II, Divisions I & II, Groups E, F & G; and Class III locations
Standards Passed	
Electrostatic Discharge (ESD)	IEC 61000-4-2, Level 3, 6 kv contact, 8 kv air
Radio Frequency Immunity (RFI)	IEC 61000-4-2, Level 3, 10V/m
Fast Transients	IEC 61000-4-4, Level 3, 4 kv input power 2 kv inputs/outputs

CONTROL DRAWING ISS-105

ASSOCIATED APPARATUS / APPAREILLAGE CONNEXE

Non-Hazardous Location

Supply Voltage

120VAC

Relay Output Rating

7 Amps @ 240VAC General Purpose
Pilot Duty 480VA @ 240VAC, B300

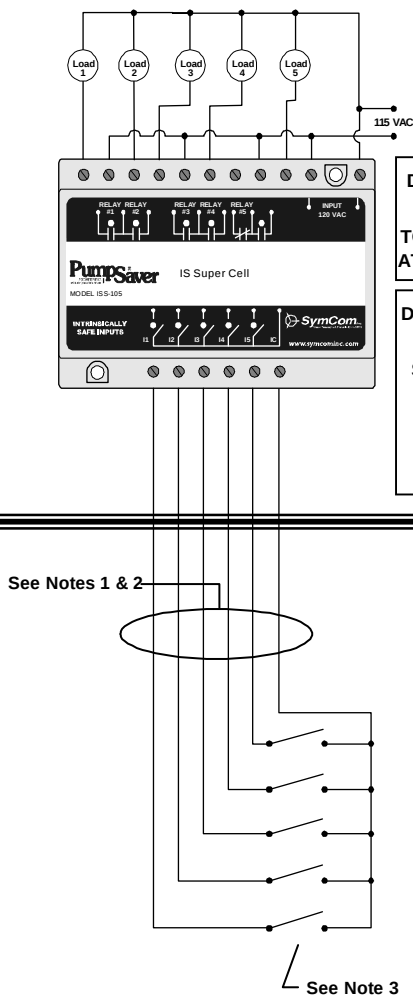
Maximum Ambient Temperature Rating

55°C

DEVICE MUST BE INSTALLED IN A SUITABLE ENCLOSURE
WARNING!
TO PREVENT IGNITION OF FLAMMABLE OR COMBUSTABLE
ATMOSPHERES, DISCONNECT POWER BEFORE SERVICING.

DEVICE MAY ONLY BE REPAIRED BY THE MANUFACTURER
WARNING!
SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC
SAFETY.

AVERTISSEMENT!
LA SUBSTITUTION DE COMPOSANTS PEUT
COMPROMETTRE LA SÉCURITÉ INTRINSÈQUE.



Hazardous Location

Class I, Divisions I & II, Groups A, B, C & D;
Class II, Divisions I & II, Groups E, F & G; and
Class III locations

NOTES:

- Maximum distance between unit and switch contact is 10,000 feet.
- All non-intrinsically safe wiring shall be separated from intrinsically safe wiring. Description of special wiring methods can be found in the National Electrical Code ANSI/NFPA 70, Article 504 Intrinsically Safe Systems. Check your state and local codes for additional requirements.
- All switch contacts shall be non-energy storing, containing no inductance or capacitance.

4. Entity Parameters:

$V_{oc} = 16.8V$ $C_a = 0.39\mu F$
 $I_{sc} = 1.2mA$ $P_o = \frac{V_{oc} * I_{sc}}{4}$
 $L_a = 100mH$

5. Entity Parameter Relationships:

<u>IS Equipment</u>		<u>Associated Apparatus</u>
V_{max} (or U_i)	$\geq$	V_{oc} or V_t (or U_o)
I_{max} (or I_i)	$\geq$	I_{sc} or I_t (or I_o)
P_{max} , P_i	$\geq$	P_o
$C_i + C_{cable}$	$\leq$	C_a (or C_o)
$L_i + L_{cable}$	$\leq$	L_a (or L_o)

Capacitance and inductance of the field wiring from the intrinsically safe equipment to the associated apparatus shall be calculated and must be included in the system calculations as shown in the table above. Cable capacitance, C_{cable} , plus intrinsically safe equipment capacitance, C_i , must be less than the marked capacitance, C_a (or C_o), shown on any associated apparatus used. The same applies for inductance (L_{cable} , L_i and L_a or L_o , respectively). Where the cable capacitance and inductance per foot are not known, the following values shall be used: $C_{cable} = 60pF/ft.$, $L_{cable} = 0.2\mu H/ft.$