

# SmartLevel <sup>™</sup> RSLC88 SmartRelay





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### **STORAGE and HANDLING**

The Reliance<sup>®</sup> SmartLevel<sup>TM</sup> RSLC88 SmartRelay meets or exceeds all applicable specifications when shipped from the factory. All parts must be inspected upon receipt to ensure that no damage has been incurred during transit. If damage has occurred, a claim should be filed with the carrier immediately.

### **GENERAL INSTALLATION**



Before installation or any servicing inside a SmartLevel system enclosure, mains power should be removed from the system and appropriately locked-out at the external source! Also verify that any electrically connected control instrumentation, if any, is properly set or bypassed! All installation steps should be performed by a qualified technician and should be executed in accordance with all applicable national and local codes. Read the entire IOM before proceeding.



ALL configurations of the RESC-XX SmartLevel systems MUST BE properly EARTH GROUNDED on the grounding stud on the lower right corner of the RSLC13 Motherboard mounting panel assembly to ensure safety. See FIGURE 1.



**FIGURE 1 – Earth Grounding** 

**CAUTION:** The RSLC88 SmartRelay can be installed in any of the vertical peripheral I/O slots in any SmartLevel system, see FIGURE 2. Before installing or removing the SmartRelay, ( or any plugin card within the system ), all power applied to the system should be turned OFF to avoid any possible damage. Extra care should be taken to assure that any installed card is fully seated in its connector and completely engaged and locked in its mechanical support rail(s) before re-applying power.



FIGURE 2 – SmartRelay installed in Motherboard

### **FEATURES**

The RSLC88 SmartRelay option adds advance PLC type control of (4) separate relays that can be programmed to open or close per measurement and/or operational conditions of the system. All relays are electrically isolated from the system and can be connected to external instrumentation or control equipment inputs for indication and/or control. See FIGURES 3 and 4 for a diagram of the front panel controls, indicators, and I/O connectors.



There are (3) methods for programming the SmartRelay. The simplest, covered herein, is the STANDALONE method using its front panel DIP switches. Here (2) MODES, BASIC and ADVANCED, allow either a simple DIRECT assignment of a single System Condition OR a FUNCTION of one or more System Condition(s) to any single relay.



FIGURE 4 – Bottom of Front Panel

In BASIC MODE, the relays can be easily programmed to indicate the direct level/status of any single Probe Module Channel, System Error, Blowdown, Water over Steam, or an EVENT input condition. In ADVANCED MODE, they can be programmed to indicate specific Conditional Functions, such as 2 OF 3 VOTING logic, BOOLEAN OR, BOOLEAN AND, and HOLD ON EVENT. In addition to programming a simple BASIC direct or ADVANCED Conditional Function, the relays can also be simultaneously programed to be asserted in either Normally Open or Normally Closed, INVERTED, contact forms AND with NO or variable DELAY timing.

### **OPERATION**

After installing the RSLC88 SmartRelay in any vertical peripheral slot in any of the systems Motherboards, the RSLC28 Main 12 channel for probe channels 1-12 or the RSLC41 24 probe channel Expansion Board, the SmartLevel system can be powered by either the RSLC25 Universal AC and/or the RSLC91 24VDC Power Supplies. Normal operation can then be verified by observing the GREEN indication of both the POWER and STATUS LED indicators on the SmartRelay's front panel, see FIGURE 3. The RSLC88 SmartRelay is now ready to be programmed. While programming, the YELLOW PROGRAM INDICATOR LED on the front panel will LIGHT/FLASH and go OFF after the last System Condition is ENTERED. Other aspect regarding the installation, operation, and maintenance of the overall system can be found in the SmartLevel's System IOM, document R500.E249.

### **SMARTRELAY PROGRAM DEFAULTS**

The SmartRelays are shipped with Relays 1 - 4 programmed in BASIC MODE, assigning Relay Outputs 1-4 to Probe Channels 1-4, respectfully, as the DEFAULT, unless specific programming is requested by the customer. Confirmation of the programmed DEFAULT or any customer programmed settings, can be verified by following the instructions in the SYSTEM TESTING section.

### GENERAL DIP SWITCH PROGRAMMING

The functions performed by the DIP switches can be broken up into the following 5 operational categories: the Operating Modes, the Relay Assignment, the Relay Assertions, (DELAY, INVERT or, HOLD), the Functions, and the System Conditions themselves. The 5 groups are as follows.

Group 1:	DIP SW1-8:	Operating Mode	RUN	/ RESET			
•	DIP SW1-7:	Operating Mode	AUT	O / MANUAL			
	DIP SW1-6:	Operating Mode	RUN	/ STROBE ENTRY			
Group 2:	DIP SW1-5:	Relay Assignment	R1	1 - 4			
•	DIP SW1-4:	Relay Assignment	R0				
Group 3:	DIP SW1-3:	Relay Assertion, Delay	D1	None, 3, 10, or 20 seconds			
•	DIP SW1-2:	Relay Assertion, Delay	D0				
	DIP SW1-1:	Relay Assertion, Contact	<b>S</b> 1	INVERT ON/OFF			
	DIP SW2-8:	Relay Assertion, Hold	S0	Event HOLD ON/OFF			
Group 4:	DIP SW2-7:	Function	P1	BASIC OR ADVANCED FUNCTIONS			
1	DIP SW2-6:	Function	P0				
Group 5	DIP SW2-5	Condition	F4	(24) Individual Probe Channel, Errors,			
1 -	DIP SW2-4	Condition	F3	Blowdown, Water over Steam, EVENT			
	DIP-SW2-3	Condition	F2	Input, Power Fail, User Program, and			
	DIP SW2-2	Condition	F1	EOP.			
	DIP SW2-1	Condition	F0				

### **OVERALL DIP SWITCH PROGRAMMING CHART**

With the DIP switch operational categories fully defined, all the settings that correspond to their individual and grouped operation programming actions can be details in the following chart in FIGURE 5.

### **BASIC DIRECT RELAY PROGRAMMING**

The BASIC or simplest way to program a Relay is to directly assign a single Relay Output to a single System Condition. This is easily done by performing the following steps with DIP switches SW1 and SW2. Follow the assignments of the DIP switch settings using FIGURE 6 as a reference. The example shown below will change the DEFAULT or previously setup program for Relay 1, closing its contact when Probe Channel 10 detects Water, with NO Delays or Holds. **NOTE** that NON-Probe Channel System Conditions can also be programmed in addition to Probe Channels.

NOTE: DIP switches are considered a "1" or OFF in the LEFT position and a "0" or ON in the RIGHT position.
 ALSO NOTE: All the information to completely program the relay is entered in a single step or DIP switch setting sequence, shown as follows.

- 1.) Enter RUN MODE by placing DIP SW1-8, RST, to the LEFT.
- 2.) Enter MANUAL MODE by placing DIP SW1-7, A/M, to the RIGHT.
- 3.) Select RELAY 1 by placing DIP SW1-5, R1, to the RIGHT and
  - DIP SW1-4, R0, to the RIGHT.
- 4.) Select NO DELAY by placing DIP SW1-3, D1, to the LEFT and DIP SW1-2, D0, to the LEFT.

<u>e</u> t	PROGRAMMING ASSIGNMENTS															
RST	A/M	SEL	R1	R0	D1	DO	S1	20	P1	PO	F4	F3	F2	F1	FO	FUNCTION
0			1	- 33		8	1	1		- 8			1	1	1	HARDWARE RESET
1						25	ļ					25				HARDWARE RUN
	0														J. J.	MANUAL/PROGRAM MODE
	1													-	1	AUTO/DEFAULT MODE
-		0				· · · ·										PROGRAM RELAY STROBE
(ő – )	8 3	1		: 32		30	<u> </u>					90 - s		2 2		PROGRAM RELAY RUN
8	3 3	-	0	0		e -	3 3		e 13	( - B		8	9 8	s - 3	8 - 8 <sup>0</sup>	ASSIGN RELAY 1
3 -	2		Û	1		<u>g</u>		( 3	- 2	- 8		<u> </u>			1	ASSIGN RELAY 2
			1	0												ASSIGN RELAY 3
			1	1											-	ASSIGN RELAY 4
		-			Û	Û							-	-	-	3 SECOND DELAY
() 	<u> </u>			: 87	õ	1	<u> </u>					90 s		2 2		10 SECOND DELAY
< - ·	ė :		2 1		1	0	ं	5 - 5	2	- 39		8		2 - 2	e 8	20 SECOND DELAY
g	2	2 3	- 3	- 8	1	1		7 - 3	- 3	- 8		<u> </u>	2	5 - 3	e - 12	
					-		Ω									
-			/ 13				1								6 - 12 1	
	-	-				÷	-	0							-	HOLD ALL RELAYS ON EVENT ON (*)
8 1	-			- 23		8X - 1	-	1		- 22		23		i i		HOLD ALL RELAYS ON EVENT DEE (*)
<u> </u>	3		1 10			8	3 3	1	Ω	0		8			5 8	ADD 2063 VOTING FUNCTION
3-		2 - 3				8		7 - 3	0	1		3				
<u></u>		-		- 10		52			1	0		SC			1.	
<u> </u>		-	/	- 25		<u>. ()</u>	1		1	1					( <u> </u>	
-	-	-					-			-	0	0	0	0	0	CLEAR ALL ASSIGNMENTS
8 - 1	-			- 23		83 - I	-	2 3		- 22	0	0	0	0	1	ASSIGN CHANNEL 1 (*)
8 - I	ė – :		8 13	: 39		8	ं	5 - 5		- 39	0	Ő	0	1	0	ASSIGN CHANNEL 2 (*)
3-1	-	<u> </u>		83		03		2 3		- 8	0	0	0	1	1	ASSIGN CHANNEL 2 (*)
			8 22			(C)	3 · ·		2 22		0	0	1	0	<u>^</u>	ASSIGN CHANNEL 4 (*)
	S3		6			6X		2 0	6		0	0	1	0	1	ASSIGN CHANNEL 5 (*)
8 1				- 23		87	-			- 23	ů.	0	1	1	0	ASSTEN CHANNEL 6 (*)
<u> </u>	-		- 6	- 8		ši –	-	<u>i i</u>	i ii	- 24	0	Õ	1	1	1	ASSIGN CHANNEL 7 (*)
2	8					22	<u> </u>	<u> </u>	- 1		0	1	0	0	<u>n</u>	ASSIGN CHANNEL 8 (*)
3-1	5	2 8		- 8		3	1	i - 8	- 3	- 8	0	1	Ň	0	1	ASSIGN CHANNEL 9 (*)
											0	1	0	1	0	ASSIGN CHANNEL 10 (*)
			0							2	ñ	1	0	1	1	ASSIGN CHANNEL 11 (*)
-									- 1		Õ	1	1	0	Ô	ASSIGN CHANNEL 12 (*)
8	-					83 - I	-			- 23	0	1	1	0	1	ASSIGN CHANNEL 13 (*)
0	<u> </u>					60	<u>, 1</u>				0	1	1	1	0	ASSIGN CHANNEL 14 (*)
2	5	2 3	( - 3			<u>2</u>		x - 3	1 8	2	0	1	1	1	1	ASSIGN CHANNEL 15 (*)
											1	0	0	0	0	ASSIGN CHANNEL 16 (*)
											1	0	0	0	1	ASSIGN CHANNEL 17 (*)
		-		- 23					-		1	0	0	1	0	ASSIGN CHANNEL 18 (*)
<u> </u>				- 23		83				- 23	1	õ	0	1	1	ASSIGN CHANNEL 19 (*)
2						22	1				1	Ō	1	0	0	ASSIGN CHANNEL 20 (*)
S - 1	ġ - 3	5 - S	t 3	- 33		S -	2 3	š – š	1	- 22	1	0	1	0	1	ASSIGN CHANNEL 21 (**)
											1	Ō	1	1	Ô	ASSIGN CHANNEL 22 (*)
											1	0	1	1	1	ASSIGN CHANNEL 23 (*)
	-			-							1	1	0	0	0	ASSIGN CHANNEL 24 (*)
Č I				8		ŝ.	-		i i	- 23	1	1	õ	Õ	1	ASSIGN MODULE/PERIPHERAL ERROR
0	8 - I					90 - T	<u> </u>				1	1	0	1	0	ASSIGN BLOWDOWN
8	ġ i	1	1			5	2 1	5 5		22	1	1	0	1	1	ASSIGN WATER OVER STEAM FRRDR
2			( - 9	- 23		2		(	0	- 8	1	1	1	0	0	TRACK EVENT INPUT
Ĩ,											1	1	1	0	1	RELAY TEST/POWER FAIL
											1	1	1	1	0	USER PROGRAM
5						<u> </u>	-			- 23	1	1	1	1	1	EOP ( END OF PROGRAM )
											-	-	-	-	-	

FIGURE 5 – SmartRelay Programming DIP Switch Assignment Chart

- 5.) Select the contact to CLOSE/NORMAL when actuated by placing DIP SW1-1, S1, to the LEFT.
- 6.) Select OFF for RELAY HOLD ON EVENT, by placing DIP SW2-8, S0, to the LEFT.

- 7.) Select BASIC OPERATION for FUNCTION, by placing DIP SW2-7, P1, to the LEFT and DIP SW2-6, P0, to the LEFT. DIP SW2-2, F1, to the LEFT, and DIP SW2-2, F1, to the LEFT, and DIP SW2-1, F0, to the RIGHT.
  8.) Select Probe Channel 10 as the CONDITION, by placing DIP SW2-5, F4, to the RIGHT, DIP SW2-4, F3, to the LEFT, DIP SW2-4, F3, to the LEFT, DIP SW2-2, F1, to the LEFT, DIP SW2-2, F1, to the LEFT, and DIP SW2-2, F1, to the RIGHT
- 9.) ENTER the program by sequentially placing DIP SW1-6, SEL, to the RIGHT AND THEN **BACK** to the LEFT position. **NOTE** that the YELLOW PGM LED, on the front panel, will temporarily light during the program entry.
- 10.) Enable the program by returning DIP SW1-7, A/M, back to AUTO MODE, by placing it to the LEFT.

00 RUN/RESET: LEFT-1 STEP 1 STEPS 2 & 10 AUTO/MANUAL: RIGHT-0 RUN/ENTER: LEFT-1 STEP 9 S ø RELAY1 R1=0: RIGHT STEP 3 W RELAY1 R0=0: RIGHT STEP 3 1 NO DELAY D1=1: LEFT STEP 4 m N NO DELAY D0=1: LEFT STEP 4 CONTACT NORMAL S1=1: LEFT STEP 5 EVENT HOLD OFF S0=1: LEFT 00 STEP 6 BASIC FUNCTION P1=1: LEFT STEP 7 ~ BASIC FUNCTION P0=1: LEFT STEP 7 o S ŝ CONDITION CH10 F4=0: RIGHT STEP 8 W 4 CONDITION CH10 F3=1: LEFT STEP 8 2 CONDITION CH10 F2=0: RIGHT STEP 8 m CONDITION CH10 F1=1: LEFT STEP 8 N CONDITION CH10 F0=0: RIGHT STEP 8 

( BLACK INDICATES POSITION OF SWITCH BAT HANDLE )

### FIGURE 6 – PROGRAMMING DIP SWITCHES SW1 & SW2

Programming the Relays can be simplified by figuring how you want each Relay programmed and entering the sequence of DIP switch settings in a SMARTRELAY PROGRAMMING WORKSHEET, or an equivalent, one for each Relay. See FIGURE 17 for a blank worksheet that can be copied and used as needed.

An example of a completed worksheet can be seen in FIGURE 7 for the programming of the previous example where Relay 1's contact was programmed to close, with No Delays or Holds, when Probe Channel 10 detected water. Each of its Step Columns show a sequence of DIP switch settings starting from all the DIP Switches on DIP Switch 1 & 2 positioned in the OFF or LEFT positions, where Step Column 1 shows the transition of DIP Switch 1-7 from LEFT to RIGHT to set SmartRelay up for programming in the MANUAL MODE, also shown in Steps 1 & 2 in FIGURE 6.

Next, since we are programming a simple BASIC setup, we can select several features at once, as shown in Step Column 2 of FIGURE 7. Here we are programming the Relay, Delay, Contact action, Hold on Event, and System Condition all as a single BASIC operation, all at once, with the DIP switch settings positioned as shown. Note that this performs Steps 3, 4, 5, 6, 7, and 8 in FIGURE 6, all at the same time.

Now that all the BASIC programming information is SET by the DIP switches, we can now ENTER or STROBE-IN the program by toggling the position of DIP switch SW1-6, Step Column 13 in FIGURE 7, to the RIGHT/OFF position <u>AND THEN BACK</u> LEFT in the OFF position. This sequence performs Step 9 in FIGURE 6.

Finally, we can RUN the entered program by positioning DIP switch SW1-7, Step Column 14, to the LEFT/RUN position performing the sequence in Step Column of FIGURE 7 and Step 10 in FIGURE 6. **NOTE** that the YELLOW PROGRAM INDICATOR LED on the front panel will LIGHT and go OFF after the program is ENTERED.



### SMARTLEVEL SMARTRELAY PROGRAMMING WORKSHEET

### FIGURE 7

Completed Programming Worksheet for Basic Programming of Relay 1, with No Delays, Inverts or Holds, measuring water on Probe Channel 10.

### ADVANCED RELAY PROGRAMMING

Where BASIC Relay programming programs only a single System Condition, ADVANCED programming programs a FUNCTION and also allows entering multiple Probe Channels OR other System Conditions to satisfy the FUNCTION. The (3) functions allowed here are the 2 OF 3 VOTING LOGIC, the BOOLEAN OR, and the BOOLEAN AND. **NOTE** that NON-Probe Channel System Conditions can also be programmed in addition to Probe Channels and that the YELLOW PROGRAM INDICATOR LED on the front panel will FLASH and go OFF after the LAST System Condition is ENTERED.

The 2 OF 3 VOTING LOGIC is pretty straightforward. After assigning this FUNCTION, (3) Probe Channels are entered in succession. The command automatically terminates the number of System Conditions entries after the third one is entered, allowing for the entire command to be ENTERED or STOBED-IN AND programming control can be returned to the RUN MODE. Note that this command ALWAYS requires (3) System Conditions. Typically, these are Probe Channels, **BUT** they can also be any other System Condition, if desired.

The BOOLEAN OR and BOOLEAN AND FUNCTIONS basically follow the entry of the 2 OF 3 VOTING LOGIC entry, EXCEPT they allow the entry of any (2) to (5) System Conditions. A BOOLEAN OR FUNCTION asserts the programmed Relay when **ANY** of it programmed System Conditions are active. A BOOLEAN AND FUNCTION asserts the programmed Relay when **ALL** of the entered System Conditions are

active. When all (5) System Conditions are programmed, just like with the 3<sup>rd</sup> in the 2 OF 3 VOTING LOGIC FUNCTION, additional System Conditions entries are automatically terminated, allowing the YELLOW PROGRAM INDICATOR LED, on the front panel to go OFF, and for it to be returned to the RUN MODE by DIP SW1-7. However, the User may not want to use/program all (5) of the System Conditions and in this situation, the SmartRelay allows the entry of a "pseudo" System Condition, EOP, as an END OF PROGRAMMING delimiter. Its DIP switch code assignment can be seen in the last row of the **Programming DIP Switch Assignments Chart** in FIGURE 5. This code is simply entered as if it is a real System Condition, terminating the programming entry with just those (2) to (4) System Conditions previously ENTERED, allowing the YELLOW PROGRAM INDICATOR LED, on the front panel to go OFF, and for The SmartRelay to be returned to the RUN MODE by DIP SW1-7.

The following (3) examples, FIGURES 8-10, illustrate the programming of the 2 OF 3 VOTING LOGIC, BOOLEAN OR, and BOOLEAN AND Functions with a mix of various Relay and Relay Assertion assignments.



### SMARTLEVEL SMARTRELAY PROGRAMMING WORKSHEET

FIGURE 8

Completed Programming Worksheet for Advanced 2 OF 3 VOTING LOGIC, Programming of Relay 2, with a 3 Second Delay, No Inverts or Holds, measuring water on Probe Channels 1, 2, & 3.

### NON-PROBE CHANNEL SYSTEM CONDITIONS

Up to now, we have been using all Probe Channel assignments for the System Conditions in the programming examples. The following are other System Conditions and their descriptions that can also be used, by themselves or mixed-in, with the Probe Channels assignments.

1.) MODULE/PERIPHERAL ERROR – This System Condition activates when a configured probe module or peripheral detects and initiates an error signal on the system bus. All error signals are "wire-OR'd" on the RSLC28 Motherboard where they can be detected and outputted by any indicating device; RSLC29 LED Display Controller, RSLI5 Medium LED Display, RSLI7 Small LED Display, RSLC31 6 Channel Relay Card, RSLC70 Front Panel, or this RSLC88 SmartRelay Card, for electrical and/or visual notification.

### SYSTEM INFO: PROGRAM FUNCTION: DATE: R3 Advanced BOOLEAN OR PC:1,2,9 & 10, No Delay, Invert, No Hold UN/RESET-LEAVE IN RUN MODE AUTO/MANUAL MOD E TO ENTER W RELAY NUMBER: 3 1 DELAY ( NONE, 3, 5, OR 10 SECONDS ); NONE 1 NTACT ASSERTION ( NORMAL ( HOLD RELAYS ON EVENT ( OFF/ON ): OF 8 1 1 UNCTION FOR 20F3 VOTIN OOLEAN OR/AND, OR BASIC: BOOLEAN OR 6 1 1 1 0 0 0 W 4 1 0 0 1 1 1 NPLIT 3 1 0 0 0 0 1 ASSIGNMENT(S): PROBE CHANNELS 1, 2, 9, & 10 2 1 0 1 0 1 1 0 0 1 1 1 1 (2) 4 6 (8) CIRCLE STEPS USED START 3 5) () 12 13 (14) STEP 7 10 11 OTES BAS BAS BAS BAS BAS ADE ADE ADE ADE ADE U EMM SVT E S SVT E S SVT E S N E S V T E S SVT E S E S EAM N NAO IAU NE NE NUO IAU Е NE NE NE C TND тт CNP CNP тт CNP 0 TTD CNP ТТ CNP ТТ ТТ TT т EUE EU EU EU Ρ ΕU EOE С EU С EU С С С RA F F RP RP F RP F R P F RP RP D L 0 D D D D D N C 0 Μ М E Ν S

### SMARTLEVEL SMARTRELAY PROGRAMMING WORKSHEET

### FIGURE 9

## Completed Programming Worksheet for Advanced BOOLEAN OR, Programming of Relay 3, with No Delays, INVERTED Contact, No Holds, measuring water on Probe Channels 1, 2, & 3.

- 2.) BLOWDOWN This System Condition activates when a configured probe module initiates a BLOWDOWN signal on the system bus. All BLOWDOWN signals are "wire-OR'd" on the RSLC28 Motherboard where they can be detected and outputted by any indicating device; RSLC29 LED Display Controller, RSLI5 Medium LED Display, RSLI7 Small LED Display, RSLC31 6 Channel Relay Card, RSLC70 Front Panel, or this RSLC88 SmartRelay Card, for electrical and/or visual notification.
- 3.) WATER OVER STEAM Unlike the System Error and Blowdown signals, this signal is computed and initiated internally by the used RSLC88 SmartRelay Card only. No signal is outputted to the RSLC28 Motherboard system bus. Here the assertion of this signal is made by ANY combination of a detected WATER signal, from any Probe Module Channel, ABOVE a STEAM signal, of ANY Probe Module Channel.
- 4.) EVENT INPUT Like the WATER OVER STEAM Conditions, this signal is detected and initiated internally by the used RSLC88 SmartRelay Card only. No signal is outputted to the RSLC28 Motherboard system bus. Here the assertion is solely made by its analog input circuitry. A GREEN EVENT INPUT LED on the front panel will indicate its detection. See the next section "USING AND SETTING UP THE EVENT INPUT", for setting up and connecting various types of signals to the EVENT INPUT.
- 5.) RELAY TEST/POWER FAIL Unlike ALL the other Non-Probe Module System Conditions, programming this condition will keep its associate Relay in the ON or closed contact asserted state. It can be used to test the continuous duty of its associated Relay OR be used as a Fail-Safe Power Fail indicator, as its contacts will OPEN on Loss of Power.

6.) USER PROGRAM – This System Condition activates by System Conditions programmed by a special User Program ENTERED AND ENABLED from the RSLC70 Front Panel. If otherwise programmed, it will do nothing and just act as a CLEARED Relay Assignment.

### SYSTEM INFO: PROGRAM FUNCTION: DATE: R4 Advanced BOOLEAN AND PC:1,2, & 3, No Delay, Invert, or Hold UN/RESET-LEAVE IN RUN MODE S W RELAY NUMBER: 4 4 1 3 ELAY (NONE, 3, 5, OR 10 SECONDS): NON 1 TASSERTION (NORMAL OR INVERT 1 LD RELAYS ON EVENT ( OFF/ON ): OFF UNCTION FOR 20F3 VOTING 1 OOLEAN OR/AND, OR BASIC: BOOLEAN AND 0 S 5 0 0 0 1 W 2 4 0 0 0 1 1 NPUT 3 0 0 0 1 1 ASSIGNMENT(S): PROBE CHANNELS 1. 2. & 3 2 1 0 1 1 1 0 1 1 1 STEP START (2)4 5) 6 7) 10 (12) (13) (14) CIRCLE STEPS USED (3) 8 9 11 OTES BAS BAS BAS BAS BAS ADE ADE ADE ADE ADE U EMM SVT SVT SVT SVT SVT ES E S E S EAM N NAO IAU NE IAU NE IAU NE IAU NE IAU NE Е NE NUO с TND CNP TT CNP CNP CNP TT CNP 0 TT TTD TT TT TT EUE Т EU P С ΕU С ΕU С С ΕU С E U ΕU EOE RA Ε RP E RP Е RP E RP Ε RP RP R 0 L D D D D D N С 0 М М E N Т

### SMARTLEVEL SMARTRELAY PROGRAMMING WORKSHEET

### FIGURE 10

# Completed Programming Worksheet for Advanced BOOLEAN AND, Programming of Relay 4, with No Delays, No Inverts or Holds, measuring water on Probe Channels 1, 2, & 3.

### USING AND SETTING UP THE EVENT INPUT

As mentioned in the previous section, the EVENT INPUT can be used to bring in an input or signal that may or may not be external to the SmartLevel system. The EVENT INPUT, when properly configured by its jumpers, see FIGURES 11 and 12, enables it to detect the following types of input signals. When detected, the GREEN LED EVENT INPUT LED, on the front panel, will light. NOTE that the programming jumper for the input selection is installed across the row of 2 pins, parallel to the front panel. See FIGURE 13 for the EVENT INPUT connector pinouts.

- 1.) 115/230 VAC Detects the presence of a nominal 115/230 VAC input, 100 250 VAC, across input pins 1 and 2.
- 2.) 24 VDC Detects the presence of a nominal 24 VDC input, 20 28 VDC, across input pins 2 and 3.
- 3.) CONTACT Detects a shorted resistance condition, 0 to 100 ohms, across input pins 2 and 3.



FIGURE 11 – EVENT INPUT & PROGRAMMING LOCKOUT JUMPERS SETTINGS



FIGURE 12 – EVENT INPUT & PROGRAMMING LOCKOUT JUMPER LOCATIONS

### **PROGRAMMING LOCKOUT FEATURE**

Re-programming or making any additions or changes to any of the existing SmartRelay programs can be lockedout or disabled by removing the programming jumper on P3. To DISABLE programming, simply store the jumper on only one of the pins.

### **INPUT AND OUT CONNECTOR PINOUTS**

Pinout connections for each Relay output and the EVENT INPUT are shown in FIGURE 13. NOTE that each relay has only 2 contact connections and can be programmed as either FORM A, Normally OPEN contacts, or as FORM B, Normally CLOSED contacts, by using the INVERT function.

O O O OPIN 3 - VDC/CNT PIN 2 - COMM PIN 2 - COMM PIN 1 - VACO O PIN 1 - CONTACT 2 PIN 1 - CONTACT 1	CONNECTOR	PINOUTS
	O PIN 3 - VDC/CNT O PIN 2 - COMM O PIN 1 - VAC	O PIN 2 - CONTACT 2 O PIN 1 - CONTACT 1
EVENT INPUT RELAYS	EVENT INPUT	RELAYS

### USING THE HOLD ON EVENT FUNCTION

The HOLD ON EVENT Function can be very useful as it allows the programmed Relay output contacts to remain in their previous or pre-HOLD state while the EVENT INPUT is Active or ON and returns them to their real-time Advanced Function state when the EVENT INPUT negates or goes OFF. One of its best uses is to HOLD a relay in a known state while a Blowdown is performed. Here, a momentary contact pushbutton switch can be connected to the EVENT INPUT, set for a Contact Input, and the button can be pressed and HELD during the 1 or 2 minutes Blowdown to HOLD the Relays contacts during the operation. FIGURE 14 is an example of the Relay programming that Holds Relay 2's contact CLOSED during a Blowdown procedure. For this example, is assumed that the 2 OF 3 Voting Logic condition was met, ( 2 of the 3 probe channels in water ), before the Event Input was asserted or the button pressed.



### FIGURE 14

Completed Programming Worksheet for Advanced 2 OF 3 VOTING LOGIC, Programming of Relay 2, with a 3 Second Delay, No Invert, Hold On Event ON, on Probe Channels 1, 2, & 3, with a N.O. momentary pushbutton switch, connected to pins 2 and 3 of the Event Input, to HOLD Relay 2 contacts CLOSED during a Column Blowdown **FIGURE** 15 shows the P3 EN PGM, P4 EVENT INPUT SELECT, the and the push button connection to the Event Input.



### FIGURE 15

Momentary normally open pushbutton connected to the Event Input to HOLD the programmed relay contacts in their pre-HOLD input state

### SYSTEM TESTING

System testing of the RSLC88 SmartRelay is suggested to verify that ALL the utilized relays have been programmed as desired. This can easily be accomplished by using the PROBE TEST DIP switches on the RSLC28 Main SmartLevel Motherboard, to simulate any Probe Channel input. A jumper or an applied AC/DC voltage can be applied, per the P4 EVENT Input jumper selection, to check the EVENT INPUT operation indicated by the GREEN EVENT LED. Any RSLC23 Probe Module or system peripheral set in the RESET State can be used to simulate a System Error. BLOWDOWN can be simulated by setting DIP switches SW1-2 FACTORY and SW1-7 MANUAL MODE on any RSLC23 Probe Module in the DOWN position, causing its BLOWDOWN and WATER SENSE outputs to FLASH. **NOTE: Be sure to RETURN ANY DIP switch used for testing and/or simulating a System Condition to its NORMAL operating position after testing!** 

### **ROUTINE MAINTENANCE**

Aside from routine maintenance required and stipulated in the SmartLevel's IOM, R500.E249, the following items can be periodically inspected.

- 1) Visually inspect the connection and integrity of <u>ALL</u> the Earth grounds within the system. It is imperative that this be maintained for safety.
- 2) Visually inspect all LED indicators for proper and desired operation and indication.
- 3) Periodically inspect all electrical connections and make sure they are free of any corrosion and are secure.
- 4) Inspect and maintain the integrity of the enclosure components to keep all electronics from the ingress of moisture.



FIGURE 16 – Typical RESC-12 SmartLevel System with the RSL88 Smart Relay and the AC/DC power supply options installed.

ORKSHEET		RUN/RESET-LEAVE IN RUN MODE	AUTO/MANUAL MODE	FOGGLE TO ENTER SETUP	DELAY NITMBED		DELAY ( NONE, 3, 5, OR 10 SECONDS ):		CUNIACI ASSERIION ( NURMAL OR INVERI ):	HOLD RELAYS ON EVENT ( OFF/ON ):	FUNCTION FOR 20F3 VOTING,	BOOLEAN OR/AND, OR BASIC:			INPUT ACCOMMENT(S)			CIRCLE STEPS USED	NOTES:	
			1															14	E A M F T D R R	
UND				0→1														13	8 8 F 9 8 8 8 F 9 8	
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### FIGURE 17 – Blank Programming Worksheet

### **SPECIFICATIONS**

RELAY Contacts:	Resistive:	10A @ 120 VAC & 28 VDC 5A @ 277 VAC 20A @ 14 VDC							
	Motor:	1/3 HP @ 125/277 VAC							
	Service Life:	Mechanical: $1 \times 10^7$ operations Electrical: $1 \times 10^5$ operations							
EVENT Inputs:	VAC: VDC:	115/230 VAC Nominal; 100 – 250 VAC 24 VDC Nominal; 20 – 28 VDC							
	Contact:	Resistive; $0 - 100$ ohms							
Clark Reliance P/N: Wire Size:	RSLC88 Smart Relay, ( Optional SmartLevel Peripheral ) Min 16 AWG/ Max 12 AWG								
Ambient Temperature:	-4F (-20C) < Ta < 122F (50C)								
Humidity:	90% Non-condensing max.								
Agency Approval:	FM 7710: Low Water Limit Control for Boilers								



### **REPLACEMENT PARTS WARNING**

THE USE OF NON-ORIGINAL EQUIPMENT MANUFACTURER PARTS (SUCH AS GASKETS, PROBES, MODULES, ETC.), WILL VOID AND AGENCY APPROVAL (FM, UL, CAS, CRN, ABS, ETC.), PRESSURE, TEMPERATURE, ELECTRICAL RATING, AND WARRANTY OF THE EQUIPMENT. CLARK-RELIANCE REQUIRES THE USE OF OEM PARTS FOR ALL REPAIRS IN/ON THIS PRODUCT IN ORDER TO MAINTAIN PLANT AND PERSONNEL SAFETY AND RELIABLE OPERATION.

CONSULT THE FACTORY OR YOUR LOCAL CLARK-RELIANCE REPRESENATIVE WITH ANY QUESTIONS. PLEASE HAVE THE MODEL NUMBERS AND/OR REFERENCE DRAWING NUMBERS AVAILABLE WHEN CALLING. YOU CAN ALSO CONTACT US AT OUR WEBSITE www.relianceboilertrim.com OR RelianceAppEng@clark-reliance.com.