

# **STARLOG**

## **4 Channel Relay Control Module**

**Model 6525A**

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# 1. INTRODUCTION

The 4-Channel Relay Control Module (Model 6525A) is an interface designed to allow the Data Logger to control four magnetically latched relays.

This permits a UNIDATA STARLOG Data Logger to be used as a controller of four external devices through the four potential free contacts.

Up to two modules can be connected to a Portable Data Logger and up to four to a MACRO Logger or STARLOGGER.



*Model 6525A 4-Channel Relay Control Module*

## 2. CONTROLLING THE RELAYS

The 4 Channel Relay Control Module is controlled by the Data Logger. The Logger provides power to the module as well as controlling the relays.

The scan synchronised power source – offered by both the Portable and MACRO Data Logger – provides power to the module. (See Connections, section 3.) This source switches on with every scan.

Each relay is controlled by command from the Data Logger using one of the High Speed Bi-Directional Serial Ports. The commands sent from Logger to Module tell the Module which relay(s) to activate. These commands are first interpreted by the module, then implemented when the Logger sends a pulse to the Module.

### 2.1. The High Speed Bi-Directional Serial Port

The High Speed Serial Port consists of a DATA line and a CLOCK line. The CLOCK enables commands sent on the serial DATA line to be interpreted correctly by the module. Each logger scan, the Serial Ports are read. The Sync signal (Pin 13 of the STARLOGGER, for instance) is used to indicate to the remote equipment that a logger read scan is about to begin. This signal is usually used to load the serial shift register(s) in the remote equipment in preparation of being read.

The STARLOGGER and MACRO Data Logger offer two bi-directional serial data ports, DATA 1 and DATA 0.

The Portable Data Logger provides one bi-directional data port, DATA 1. Either CLOCK 0 or CLOCK 1 can be used with DATA 1. The Portable Data Logger's DATA 0 is unsuitable because it cannot be used to *send* data.

The examples and explanations in this supplement assume you are using DATA 1 and CLOCK 1.

## **2.2. Programming the Relays**

This section provides a simple example of how to program the relays. In some cases, the skills of an experienced Programmer may be necessary. In summary, the procedure of programming the module is:

1. Create and Save a Scheme.
2. Decide when you want to open and close the relays.
3. Identify which addresses in Data Logger memory will be used and which instructions you'll require – usually, JUMP (and its variations), LOAD, SEROUT and PULSE. (Refer to the STARLOG Programming supplement 6201.)
4. Use an ASCII editor to modify the Logger Program file, *SCHEME.SRC*. Add the instructions in the appropriate places. Save the file.
5. Use PDLASM to assemble the revised file.
5. Finally, load the Scheme into the Logger.

### **2.2.1. Step 1: Create and Save a Scheme**

In this example, two of the relays on the 4-Channel Relay Control Module are used to operate alarms when the water level of a river is either very high or very low. A Hydrostatic Water Depth & Temperature Probe (model 6508A) connected to a Portable Data Logger is used to monitor water level in the river.

The Scheme: Every 5 seconds (scan rate) data from the probe is being sent to a Portable Data Logger on Analog Channel 0 (a0).

Using the STARLOG Software Package create a Scheme which includes the above details. You will also want to include when and what to log and how to present the data, like in a report or a plot. (See the STARLOG Users Manual.)

### **2.2.2. Step 2: Decide When to Open and Close the Relays**

The river height is usually approximately  $\frac{1}{2}$  metre. If it drops to 25 cm, then the cattle will have to be moved into a paddock with a dam. On the other hand, if the river rises to 75 cm, then the pump will have to be relocated. When the probe measures 25 cm or less we want to trigger the LOW alarm. When the probe reads 75 cm or higher we want to trigger the HIGH alarm.

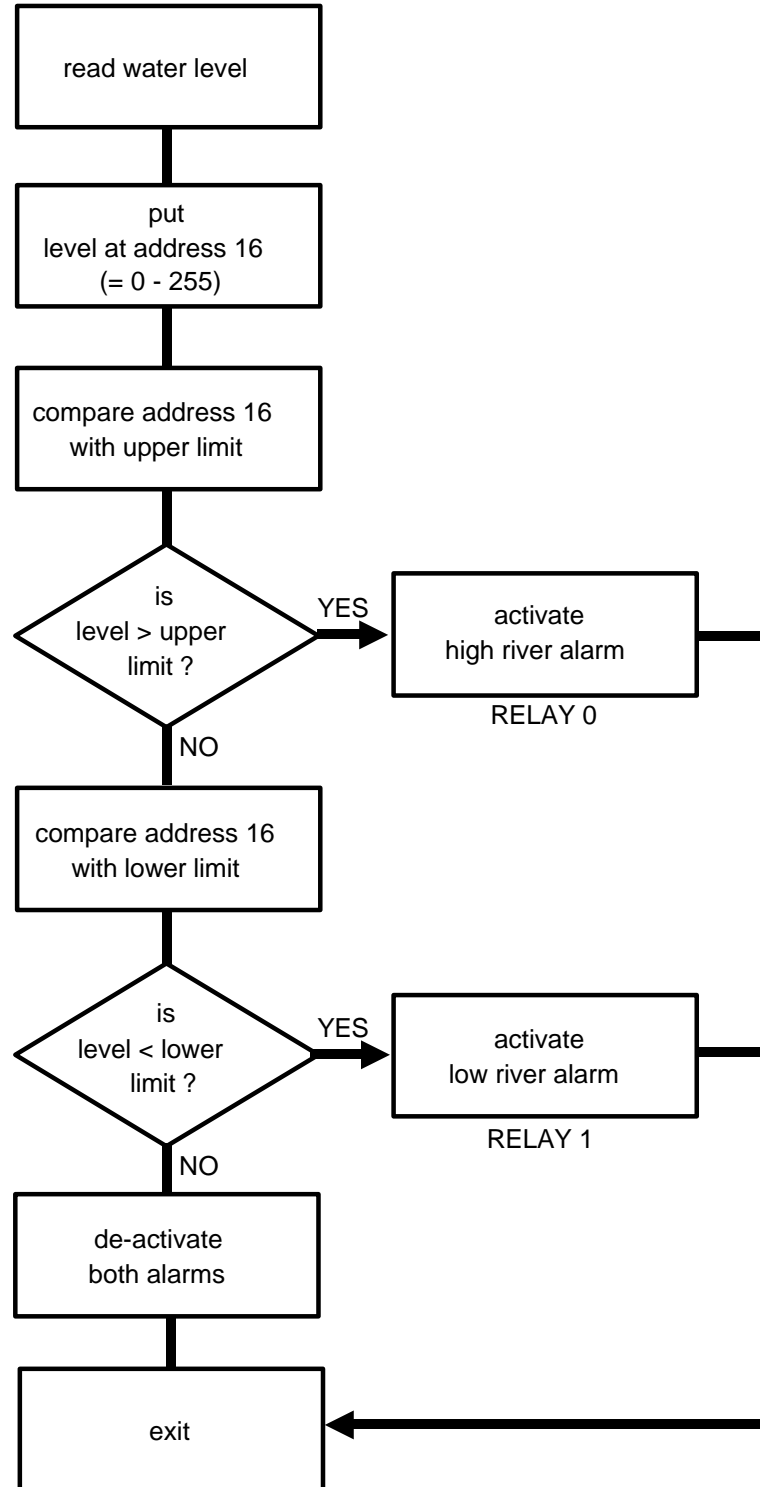
Data from the Water Depth Probe on Analog Channel 0 is temporarily stored in the Logger's Hardware Register in Address 16 (the address for a0). It is this

reading that we will use to trigger the alarms. Therefore, the readings in address 16 which will trigger the alarms are:

This is a value which corresponds to actual height on a scale from 0 to 255 where 0 is 0 metre and 255 is 1 metre.

Label	Actual Height	As Read by Logger *
High	75 cm	191
Low	25 cm	63

In this example you will connect the High River alarm to Relay 0 and the Low River alarm to Relay 1. You will want Relay 0 to open when data in Address 16

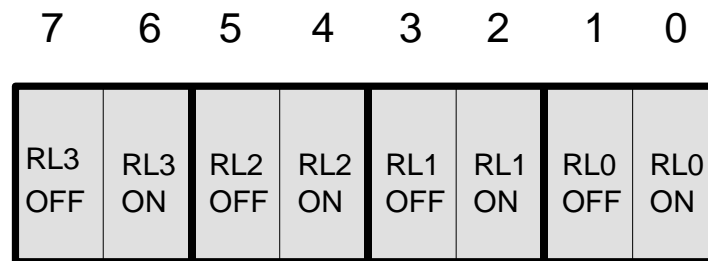


reads 191 or greater. This sets off the High River Alarm. Likewise, you will want Relay 1 to open when the data in Address 16 reads 63 or less. This sets off the Low River alarm. A flow diagram (below) illustrates this process.

### 2.2.3. Step 3: Identify Addresses and Choose Instructions

You already know that you want to compare data in address 16. Now you have to select an unused address in the Logger Hardware Register into which the control byte for the Relay Module is written. In this example, you will use address 90.

Instructions are listed in detail in the STARLOG Programming supplement 6201. For this application, you are most likely to use JUMP (and its variations), LOAD,



1 = TRUE    0 = FALSE

SEROUT and PULSE.

The control data is given to the module using the SEROUT instruction and then output to the relays by a 10 milli-second pulse using the PULSE instruction.

The control byte is of the following form:

i.e.,

Relay 0 = ON    = 0000 0001 = 1

Relay 0 = OFF = 0000 0010 = 2

Relay 1 = ON    = 0000 0100 = 4

Relay 1 = OFF = 0000 1000 = 8

Relay 2 = ON    = 0001 0000 = 16

Relay 2 = OFF = 0010 0000 = 32

Relay 3 = ON    = 0100 0000 = 64

Relay 3 = OFF = 1000 0000 = 128

eg, relays 0 and 3 OFF, 1 and 2 ON

output byte = 1001 0110 = 150 = 2 + 4 + 16 + 128

## 2.2.4. Step 4: Modify the Logger Program file

In order for the Logger to control the Relays, you will want to add a few lines to the Logger Program file. This is the file which is generated by the Software Package each time you Save a Scheme. It is given the Scheme Name followed by the extension .SRC. For instance, the Logger Program file for a Scheme called RIVER would be:

```
RIVER.SRC
```

The Logger Program file is an ASCII file. To add the lines which control the Relay Module use a word processor which can edit and save ASCII files.

The lines you will add to RIVER.SRC for this example are:

SCAN:	JMPGE 16,#191, HIGH	(jump to HIGH if the (value in address 16 is (greater than or equal to 191)
	JMPLE 16, #63, LOW	(jump to LOW if the value (in address 16 is less than (or equal to 191)
	LOAD 90, #170	(Load into address 90) (the control byte 170) (which means all relays off)
	JMP RELAY	(Jump to RELAY)
HIGH:	LOAD 90, #9	(Relay 1 Off, Relay 0 On)
	JMP RELAY	(Jump to RELAY)
LOW:	LOAD 90,#6	(Load 6 into address 90) (Relay 0 Off, Relay 1 On)
RELAY:	MOVWW 9,#8208	(Prepares the Logger to (DATA 1 and CLOCK 1)
	SEROUT #1,90	(Send 1 byte from address) (90 to the module)
	PULSE #45	
	EXIT	

Finally, save the RIVER.SRC file.

## 2.2.5. Step 5: Assemble the Logger Program File

Once the Logger Program file has been modified and saved you will want to use the Assembler in STARLOG Software to assemble it before you load the Scheme into a Logger.

In the current working directory, type the command:

```
PDLASM RIVER.SRC
```

## 2.2.6. Step 6: Load the Scheme into the Logger

Using the menu-driven STARLOG Software Package select **Use a Scheme** from the main menu, then **Choose a Scheme** and finally, **Program Logger with Scheme**.

Remember that if you at any time modify the Scheme using the menus, you will need to once again add commands to the Scheme Program file and assemble it in order to use the 4-Channel Relay Control Module.

## 2.3. Serial Communication Instructions

The Logger provides the following instructions for serial communications:

SERIN, SEROUT	all Loggers DATA0
SERIN0, SEROUT0	used for DATA0 in MACRO Logger and STARLOGGER
SERIN1, SEROUT1	used for DATA1 in MACRO Logger and STARLOGGER

### ■ SERIN x,y,z (SERIN0 and SERIN1)

extract x bytes of serial data from the specified data line and store that data in Block z, Locations y, y+1 ... y+x.

eg, SERIN 4,50,1 = 72,4,50,1

will cause four bytes of data to be read and stored in Block 1, Location 50 to Block 1, Location 53 (addresses 306 - 309).

### ■ SEROUT x,y,z (SEROUT0 and SEROUT1)

is similar to the SERIN instruction except that data is taken from Block z, Location y etc. and output on the appropriate data line.

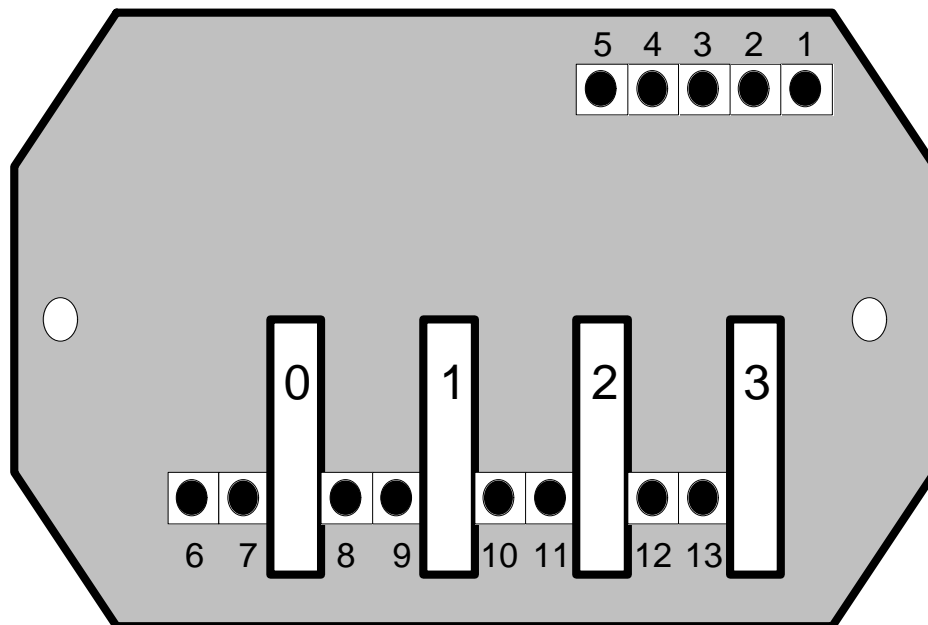
Another variation of the above two instructions allows the user to 'point' to the address where the data will come from/go to, ie y contains the address of a pointer to the actual data area.

Further to the above instructions, it must be specified which DATA and CLOCK lines are being used. This is done by placing particular data in addresses 8, 9 and 10.

Address 8 =	32 if CLOCK 1 is used, (A8=0 if not)
Address 9 =	16 if DATA 1 is used,
Address 9 =	128 if DATA 0 is used,
Address 10=	64 if CLOCK 0 is used, (A10=0 if not)

### 3. CONNECTIONS

4-Channel Relay Control Module		Portable Data Logger		MACRO Data Logger	
Terminal	Function	Pin	Term.	Pin	Term.
1	PULSE	17	42	33	9
2	CLOCK 1	22	13	13	16
3	DATA 1	10	45	31	15
4	GND	23	10	17	13
5	+5V	13	15,16,17	18	49
6	RELAY 0 output	External Connection			
7	RELAY 0 output				
8	RELAY 1 output				
9	RELAY 1 output				
10	RELAY 2 output				
11	RELAY 2 output				
12	RELAY 3 output				
13	RELAY 3 output				



4-Way Relay Module Layout

## 4. TEST PROGRAM

You can use the Test a Logger menus in STARLOG Software to check the operation of the module. Use the PDL Information menu and the PUT and ADDRESS commands to enter the following data.

PDL only, not needed  
for a MACRO Logger.

Address 8 : 0,16,32,0 (for DATA 1 and CLOCK 1)

Address 51 : 170

Address 384 : 8,4,1,6,~~76,1,50,0~~ ← These numbers are 77 for a  
MACRO Logger

Address 392 : ~~24,0,45,0,0,0,0,0~~

Address 400 : 76,1,51,0,24,0,30,0

Address 408 : 0,0,0,0

Then, by putting the following at address 50, each relay can be turned on and off, each log cycle, in turn.

Address 50 :           1 (relay 0)  
                          4 (relay 1)  
                         16 (relay 2)  
                         64 (relay 3)

## 5. SPECIFICATIONS

Dimensions: 75mm x 125mm x 80mm  
Input: programmable output control from Logger  
Output: potential free latched relay contact (DPDT)  
Power Usage: 2mA max.  
Relay Contact  
Ratings: 240V AC @ 0.5 A max.