



# TEAM DIGITAL

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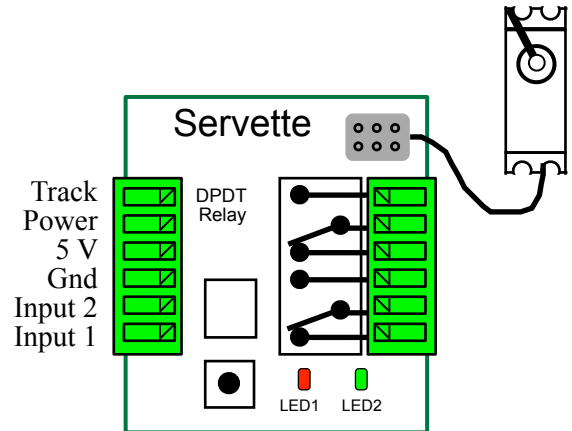
## Servette™ Single Servo Controller

- > DCC compatible accessory decoder
- > Controls 1 servo and 1 DTDP relay
- > Programmable position, range and speed of servo
- > “Speed\_to\_Position”
- > Input for local control of servo and relay
- > Remote controlled routes for turnouts
- > Multiple addresses for routes



### Description

The Servette is a DCC compatible accessory decoder capable of driving a servo motor and relay. Each output can individually be assigned any address from 1 to 2040. It has two inputs for local control of the outputs. There are several modes of operation. The modes are grouped into two basic configurations based on how the servo is used.



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# 1 Introduction

The Servette is a DCC compatible accessory decoder capable of driving a servo motor and relay. Each output can individually be assigned any address from 1 to 2040. It has two inputs for local control of the outputs. There are several modes of operation. The modes are grouped into two basic configurations based on how the servo is used.

## **The first basic configuration is moving the servo to two positions.**

Mode 1 - The servo output and relay can be used for turnout control. There is a separate address for each output so they can be controlled individually. There are a total of two switch addresses. In this mode a servo could also be used for crossing gates. An option allows for the relay to flash LEDs in relation to the servo.

Mode 2 - *Factory default* - The servo output and relay can be used for turnout control. The servo output and relay have the same address. There are a total of one switch address. The relay can be used to drive LEDs to show the state of the servo output or used for turnout frog power routing.

## **The second basic configuration is for moving the servo to three positions.**

Mode 3 - The servo output can be used for semaphore control and the relay can be used for other control. There are a total of four switch addresses. Three addresses for the servo output and one address for the relay.

In this mode three addresses are used to control the servo, address A(throw) will command the servo to one end, address A+1(throw) will command it to the center and address A+2(throw) will command it to the other end. An optional behavior for the servo is available to use only a single address A(throw) to sequence or rotate through all three positions. Each time that address command is issued the servo moves to the next position (red > yellow > green > red ..etc).

Mode 4 - The servo output is used for semaphore control and the relay used for other control. One switch address controls the relay. The servo output is ONLY controlled by inputs. This provides for direct control of a semaphores by block detectors. More block detectors and Servettes can be ganged together in this way to easily expand the system.

“Speed\_to\_Position” is an optional behavior that allows the throttle to variably control the position of the servo. Just as the throttle can be used to change an engine’s speed, so can it be used to control the position of a servo. The throttle speed step must be set to 128.

A type of route control is available. This is done by adding up to seven additional address that the servo will respond to.

***Caution! For their size, servos have a lot of power. We recommend you initially center the servo’s rotation before linking it to a device. Semaphores and other devices can be easily damaged.***

## **1.1 LED Indicators**

LED 1 flashes indicates “Smart” programming. LED 2 indicates relay state

# 2 Getting Started

The Servette comes from the factory ready to use in mode 2 with the output set for turnout control. Plug a servo into the output. Connect RAIL A and RAIL B terminals to the track power. The connection locations are shown on the diagram on the front page. You are now ready to control your switch from the throttle. The default output address is 1. See adjusting servo below.

You can control the output from fascia buttons by connecting them to the primary input. The primary input, when grounded, will toggle the servo output.

If you want to change the mode or the output address see the “Smart” Programming section. If you want to customize the Servette such as enabling “Speed\_to\_Position”, see the Configuration Variables section.

## **2.1 Adjusting Servo Movement**

The total movement or range of a servo is typically much more than is required for turnout or semaphore control. For this reason the range of the servo may need to be adjusted for the specific application. In addition the center of movement or center offset may need to be changed. The Servette has a built in feature (not in mode 4) that causes the servo to repeatedly move back and forth from one end of the range to the other. All these CVs can be programmed in ops mode (on the main programming) while directly observing the results.

**Before linking the servo arm (horn) to a device manually position the servo to the center of it’s rotation.**

1. Use the “Smart” button to put the Servette into ops mode as described in section 4.

2. Use your throttle to enter ops mode with a loco address of one (1). One is the default Servette ops address. The servo may twitch or jump during adjustment.

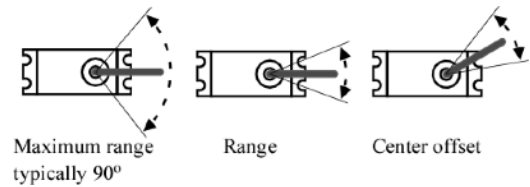
3. Program CV7 with a value of 2 to put the servo in the center position.

4. Program CV10 to change the center offset. Start with a value of 60 and repeat with small changes until the desired center is reached.

5. Program CV7 with a value of 4 to move all the servos to one end. Program CV7 with a value of 5 to move all the servos to the other end.

6. Program CV3 to set the desired range. Start with a value of 20 (increase range with higher numbers) and repeat with small changes as needed.

7. When finished adjusting the servo, program CV7 with a value of 1 to restart the Servette.



### 3 “Smart” Programming

“Smart” programming is a term used to describe a method to program Configuration Variables (CVs) using switch addresses. This method is a much easier way to program CVs. With “Smart” programming, you can set the output addresses, the modes and options.

To program in “Smart” mode, connect the Servette RAIL A and RAIL B terminals to the track power. Turn on power and wait until the LED1 (typically red) turns off. To change the output addresses follow these steps.

1. Press the “Smart” program button and hold it down for approximately one second until LED1 (typically red) starts to flash. Then release it. The Servette is now ready to have the output addresses changed.

Smart Programming of Servette Mode	Address
Mode 1 - Servo 2 positions, both outputs have unique address	1
Mode 2 - Servo 2 positions, relay has servo address	2
Mode 3 - Servo 3 positions, both outputs have unique address	3
Mode 4 - Inputs control servo, relay has unique address	4
Mode 1 with flashing relay, servo cw	5
Mode 1 with flashing relay, servo ccw	6
Mode 3 with sequencing servo behavior	7

2. Using the throttle select the switch address you want for the servo and issue a throw (reverse) command. LED2 (typically green) will flash briefly.

LED1 now flashes twice with a pause and then repeats indicating that the relay address is ready to be programmed.

3. Again using the throttle select the switch address you want for the relay and issue a throw (reverse) command.

At any time you can exit “Smart” mode by pressing the button for approximately one second until LED1 stops flashing.

To change the Servette mode and CV29 options start from one of these places.

1a. Continue from step 3 above. When all the addresses have been programmed LED2 (typically green) will turn on and LED1 will flash.

1b. Press the “Smart” program button and hold down for approximately three seconds until LED2 turns on. Then release it. LED1 will be flashing.

2. Using the throttle select the switch address correspond to the desired mode.

Issue a throw command to select the mode. At this point, LED2 turns off.

LED1 now flashes twice with a pause and then repeats indicating that option 1 is ready to be set.

3. Using the throttle select any switch address you want, issue a throw command to set Option 1 (default output state) or a close command to clear it.

LED1 now flashes three times with a pause and then repeats indicating that option 2 is ready to be set.

4. Using the throttle select any switch address you want, issue a throw command to set Option 2 (ops mode) or a close command to clear it.

LED1 now flashes four times with a pause and then repeats indicating that option 3 is ready to be set.

Smart Programming Summary			
#Flashe	Description	t	c
<i>To start - Press the “Smart” button until LED1 starts to flash</i>			
1	Output 1 address - Servo	accept	accept
2	Output 2 address - Relay	accept	accept
<i>To start here - Press the “Smart” button until LED2 lights</i>			
1	Mode selection - 1 to 7 see chart above	accept	accept
2	CV29 Option 1 - enable fixed output state at power on	set	clear
3	CV29 Option 2 - disable power save	set	clear
4	CV29 Option 3 - enable ops (on the main) mode	set	clear

5. Using the throttle select any switch address you want, issue a throw command to set Option 3 (power save off) or a close command to clear it (power save on).

This concluded the “Smart” programming. At anytime you can exit “Smart” programming by holding down the “Smart” button until the LEDs turn off. Any programming that was done will be save. Note: When a Mode is selected the behavior CV is cleared.

Switch (Turnout) Terminology		
This manual	throw or t	close or c
Digitrax	throw or t	close or c
NCE	reverse or OFF or 2	normal or ON or 1
Lenz	-	+
MRC	OFF	ON

## 4 Configuration Variables (CVs)

The Servette supports **Paged Mode Programming in Service Mode and Ops Mode**. To program in paged mode, connect terminals Rail A and Rail B to the programming track. See diagram on the front page. When power is applied, LED 1 will come on and LED 2 will flash when programming is successful. Some systems only apply power during actual programming, so LED1 will only be on during that time. The Servette does not have built in feedback like a mobile decoder. Because of this, some systems may show a “no decoder on track” error or “can not read CV”. However it still is programmed. To enter normal operation, disconnect from the program track. Now connect terminals Rail A & B to the main track power.

Ops mode or “on the main” programming is very convenient because you can try out the CV changes almost immediately. In order to use this type of programming the ops mode loco address must be set in CV31 (default is 1) and option 3 must be set in CV29. **This is a loco address, so be careful when using this feature.** You can immediately start programming in “Power On” ops mode without programming CV29 by holding down the Smart button just before power is turned on. When LED2 turns on release the button then wait until LED1 turns off. This temporarily sets option 3 until power is turned off. When using ops mode to change CV values, the Servette does not recognize the new values until power is turned off and then back on.

Programming CV7 with a value of 1 will restart the Servette so power need not be cycled when programming in “Power On” ops mode. This is the same as turning power off and then back on.

Programming CV7 with a value of 2 will cause all the servo to move to their center position. You can then program the center offset CVs if needed.

Programming CV7 with a value of 3 will cause all the servo to move from end to end of their range. You can then program the range CVs to easily adjust the servo’s movement.

**Note:** When adjusting servo position, be sure Speed\_to\_Position is disabled. Also if you program when the servo is moving it my jump erratically.

Programming CV7 with a value of 170 will “reset” all CV’s to the factory default value. In page mode this may not work with some systems as they do not keep power applied to the programming track long enough for all the CVs to be programmed.

A very easy way to “reset” to all factory defaults is to enter “Smart” programming and continue to hold the button down (at least 16 seconds) until both LEDs are alternately flashing.

### Summary of ops mode programming commands for servo adjustment section 2.1.

To center the servo, program CV7 with 2.

To move the servo back-n-forth, program CV7 with 3 (movement not accurate with large range values).

To move the servo to one end, program CV7 with 4.

To move the servo to the other end, program CV7 with 5.

To restart the Servette when finished with programming, program CV7 with 1.

### 4.1 Output Address

CV1, CV9 - Servo address.

CV5, CV6 - Relay address.

These CVs determine the address of the

outputs. This is the normal DCC accessory decoder address. Each output has two CVs, an address and an address adder, that makes up the address. See section 7 for CV numbers. If an address greater than 255 is needed then use the address adder. The address adder value represents a number that is added to the address value to give the ‘actual’ address. The following table shows the CV value to use for the adder. For easier programming see “Smart” Programming.

Address, a value from 0 to 255, Address adder, a value from 0 to 7

Example: Output 1 address of 20, set CV1 = 20 & CV9 = 0

Output 1 address of 524, set CV1 = 12 & CV9 = 2

**Note:** Some systems refer to CV1 as AD, AD2 or short address.

Address Adder										
CV Value	0	1	2	3	4	5	6	7	8	9
ADD	0	256	512	768	1024	1280	1536	1792	2048	2304

### 4.3 Servo Center Position

CV10 - Center Position, a maximum value of 127.

This CV determines the servo's center position of the move range.

If the value of these CVs are set too close to either zero or 127 than the range of movement as defined by the move range will not be available.

### 4.3 Servo Move Range

CV3 - Move Range, a maximum value of 127.

This CV determines the servo's range or how far it moves.

A typical value to move a turnout is probably between 15 and 25 depending on the mechanical connection from the servo to the turnout.

Timing: Output servo pulse: 1 ms - 2 ms with 8 us resolution. This pulse range will give a servo about a 90 degree move range. Many servos can physically move more than 90 degrees.

CV10 - Center Position, a maximum value of 127.

This CV determines the servo's center position of the move range.

If the value of these CVs are set too close to either zero or 127 than the range of movement as defined by the move range will not be available.

### 4.4 Servo Move Speed

CV67 - Move Speed, a maximum value of 127.

This CV determines the servo's speed when it moves.

The larger the number the slower the servo moves. A value of zero will cause the servo to move at it's maximum speed.

If the servo is being adjusted as mentioned in section 2.1 then do not slow the servo speed down until after the adjustment. If

the servo is moving too slow it may not reach it's ends when moving back and forth.

**Note:** Reasons why you may see the servo move at maximum speed at power on even if the servo move speed has been set to a very slow value.

1. If the servo position is changed during power off.
2. Some servos twitch, jump or move erratically when power is first applied to them.
3. If the fixed state of the servo at power on (Option 1) has been enabled and the state at power off does not match that state. These occur because at power on the Servette does not know where the servo position actually is and commands the servo to move to the position stored in CV33.

### 4.5 Servo Behavior

CV71 - Behaviors

This CV determines various servo behaviors.

A value of 1 causes the servo to use only a single address A(throw) to sequence or rotate through all three positions. The SMC8 must be in mode 3.

A value of 2 enables Speed\_To\_Position. The Servette now uses the selected servo's address as a loco address. Speed steps must be set to 128 for this to work. Do not try and use this address as an accessory address at the same time.

A value of 16 reverses the LED indication the match the desired close/throw position. Determine this after setting the servo position as it affects this.

A value of 128 reverses the servo position in response to commands. For example if the servo moved cw (clockwise) when issued a close command, it will now move ccw. This has the same result as reversing the wires that power a stall motor.

Note: In Smart programming when a Mode is selected this behavior CV is cleared. If the servo direction needs to be reversed program this after Smart programming.

Servo Behaviors	Value	Select
None	0	
Sequence or rotate	1	
Speed To Position	2	
Reverse LED indication	16	
Reverse servo position	128	
Program this value into the configuration CV		

Select One

### 4.6 Configuration

CV29 - Configuration

This CV determines the decoder configuration options.

See section 1 for a detailed description of the modes.

Option 1 - At power on, after about five seconds, each output will be set to the state as determined by CV33 and CV34. You must program CV33 and CV34 to the desired state at power on.

Option 2 - Normally the Servette stops the control signal (pulse) to the servo after it has completed it's move. With this option the control signal is always on. This will draw more power from the track based on servo load.

Option 3 - Ops mode programming. Allows Operations mode (On the Main) programming using a Loco address to be enabled all the time. The "Smart" button is no longer required to enter Ops mode. See section 4.12.

Configuration CV	Value	Select
Servette Mode 1 - Servo 2 positions, output 2 has unique	0	
Servette Mode 2 - Servo 2 positions, output 2 has servo address	1	
Servette Mode 3 - Servo 3 positions, output 2 has unique	2	
Servette Mode 4 - Inputs control servo, output 2 has unique	4	
Option 1 - enable fixed output state at power on	8	
Option 2 - <b>disable</b> power save	16	
Option 3 - enable ops mode programming**	32	
Program this value into the configuration CV		

Select One

To combine options add their value together. In the case where only one selection is possible a box shows “Select one”.

\*\* If power save is disabled , option 2, there will be erratic servo movement whenever a CV is programmed. Therefore, program all CVs before setting option 2.

#### 4.7 Input Control

CV - 36 Pro input control

CV - 44 Sec input control

These CVs determine what action the inputs will have when activated. See section 7 for CV numbers.

There are 2 physical input terminals. one primary and one secondary. The secondary input is dependent on the primary one. That is, when the primary input is grounded, the secondary input is nonfunctional. This mean only one input can be used at any given time.

Pri & Sec Input Control			
Control CV	Value	Select	
Input disabled	0		Select
On low to high transition**	1		
On high to low transition	2	2	
On change transition (both low to high and high to low)**	3		one
Transition toggles output***	4	4	Select
Transition closes the output	0		
Transition throws the output	8		One
Output 1, servo <i>example for</i>	16	16	Select
Output 2, relay	32		One
Throw on hi to lo transition, close on lo to hi transition****	128		
Program this value into the appropriate action CV		22	

The following table shows how each CV is defined and the value of each selection. Add the value of the selections together to determine the value to program the CV. In some cases only one of several selections are possible and are shown by a box as “Select one”.

\*\* Not recommended for secondary input

\*\*\* If the Servette is in mode 3 then each button press moves the servo to the next position.

\*\*\*\* Input one only (version 14 and later)

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\*\*\* If the Servette is in mode 3 then each button press moves the servo to the next position.

\*\*\*\* Input one only (version 14 and later)

In order for an input to cause an action, a transition must be selected. Each input has a ‘pullup’ resistor connected to 5 volts, so the input is normally at 5 volts. An input transition is when the voltage on an input goes from high to low (falling edge) or from low to high (rising edge). For example, if a push button is connected to an input and ground, when it is pressed the input is grounded. This causes a high to low transition. When the button is released this causes a low to high transition.

Example: Primary input when grounded will toggle output 1.  
Action CV36=2+4+16=22 (example shown above in table)

**Tip:** Use ops mode to quickly experiment with input settings.

#### 4.8 Power On Output State

CV33 - Power on state for output 1 (Servo)

CV34 - Power on state for outputs 2 (Relay)

These CVs determine the state of each output at power on. The Servette automatic programs these CVs unless Option 1 is set. Outputs do not function in this manner in Mode 2.

Output 1 - Servo	Value	Select
Output 1 throw	1	
Output 1 close	2	
Program this value into CV33		

Output 2 - Relay	Value	Select
Output 2 throw	1	
Output 2 close	2	
Program this value into CV34		

If both are selected for the servo it will go the the center position. However this feature will not work correctly for the relay. If neither throw or closed is selected the outputs may not work correctly at power on.

**Tip:** An easy way to program CV33 and CV34.

1. Enter normal operating mode and command each of the outputs to the desired state.
2. Enter programming mode and program CV29 (enable option 1).
3. Exit programming mode.

Now at each powered on, the outputs will go to the same state as set in step 1.

#### 4.9 Output Flashing Effect

CV75 - Output flash

This CV determines if the relay will flash. It is dependent on the servo. It will cycle on/off based on the state of the servo. Works only in mode 1.

#### 4.10 Ops Mode Loco Address

CV31 - Ops mode address, a value of 1 to 127. Default is one (1).

This CV sets the operations mode program address. Program the Servette just like you would a loco in ops mode. This is a loco 2 digit address and therefore must be unique among locomotive addresses. Option 2 must be enabled to use this address for programming on the main. The programming track is not required once this address and option 2 have been set. TIP: If the “Smart” program button is pressed when power is turned on, option 2 is enable until power is removed. This is useful if you do not want to have ops mode enabled all the time.

Output Flashing	Value	Select
None	0	
Relay will flash when the servo is in the cw position	1	Select
Relay will flash when the servo is in the ccw position	2	One
Program this value into the configuration CV		

#### 4.11 Input Lockout Address

CV76 - Address, value 0 to 255: CV77 - Address adder, value 0 to 9

These CVs set the input lockout address. When a switch (turnout) throw command is issued that matches this address the Servette inputs are disabled. When a close command is issued with this address the inputs are enabled. This feature is useful for dispatcher control when the Servette inputs are used for local turnout control.

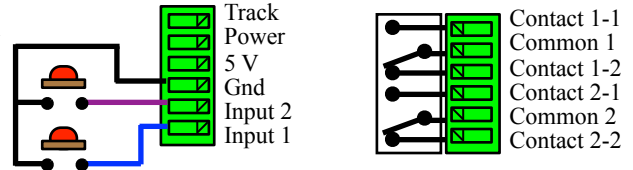
#### 4.12 Startup Delay (version 14 and later)

CV78 - Startup delay from power on, a value of 4 to 127. Default is four (4).

Delay = CV value x 1 seconds.

### 5 Connections

The track power terminals are for connecting power to the Servette. This can be from Rail A and Rail B. 5 volt can be used to power an external device like a block detector. The ground and inputs can be used to connect push button for local control. The connectors are spring type terminals. Use a small screw driver to push in on the slotted button and insert the bare wire into the terminal.



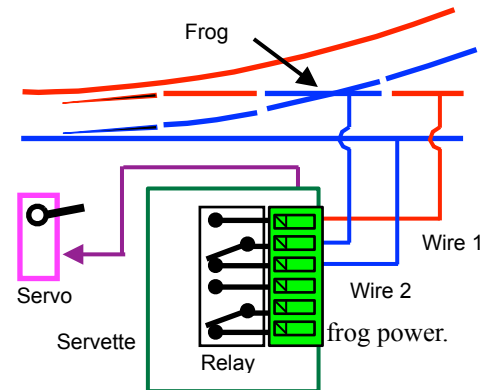
The servo connector is made so that you can just plug the servo harness in. There is a duplicate for output 1 so that two servos can be plugged in and be controlled the same.

### 6 Applications

#### 6.1 Frog Power

If the servo is being used for a switch machine, you can use the relay output for power routing to track or frog. The Servette must be set to Mode 2. Maximum relay current is 3 amps. In this mode the relay can also be used for turnout status.

The relay wiring shown is very close to the actual except for Wire 1 and Wire 2. These wires may have to be reversed at the relay terminals so that the correct rail polarity gets to the frog. This will be determined by the way the servo is mounted and linked to the turnout. Either set of relay contacts can be used for



#### 6.2 Input Semaphore Control

The primary input connector provides a 5 volt source, so DBD22s (block detectors) can be powered. When connected to an input the Servette can be controlled by block occupancy.

Input - Output Relationship		
Input State	Servo Position	
Pri Input 1 Lo, Sec Input 1 Hi	Red	Servo
Pri Input 1 Hi, Sec Input 1 Lo	Yellow	
Pri Input 1 Hi, Sec Input 1 Hi	Green	

By setting the Servette to Mode 4, you can use the inputs connected to DBD22s to move the servo to three positions. This provides an easy way to implement ABS signal control with semaphores.

The chart below shows the input state in relation to the servo position. The position is shown as red, yellow and green. Yellow is the center position and red and green is either end of servo travel depending on how you have the servo behavior set.

**Note:** In Servette mode 4 the special feature described in section 2.1 to adjust servo position does not work. Use the special feature to adjust the servo and then enter mode 4.



## 7 Summary of Configuration Variables

CV#	Function/Default Value		CV#	Function/Default Value	
1	Servo Address	1	43	reserved	-
2	reserved	-	44	Sec Input Control	26
3	Servo Move Range	100	45	reserved	-
4	reserved	-	46	reserved	-
5	Relay Address	9	47	reserved	-
6	Relay Address Adder	0	48	reserved	-
7	Manufacturer Version No.	-	49	reserved	-
8	Manufacturer ID	25	50	reserved	-
9	Servo Address Adder	0	51	reserved	-
10	Servo Center Position	62	52	reserved	-
11	reserved	-	53	reserved	-
12	Route 1 Address	0	54	reserved	-
13	Route 1 Address Adder	0	55	reserved	-
14	Route 2 Address	0	56	reserved	-
15	Route 2 Address Adder	0	57	reserved	-
16	Route 3 Address	0	58	reserved	-
17	Route 3 Address Adder	0	59	reserved	-
18	Route 4 Address	0	60	reserved	-
19	Route 4 Address Adder	0	61	reserved	-
20	Route 5 Address	0	62	reserved	-
21	Route 5 Address Adder	0	63	reserved	-
22	Route 6 Address	0	64	reserved	-
23	Route 6 Address Adder	0	65	reserved	-
24	Route 7 Address	0	66	reserved	-
25	Route 7 Address Adder	0	67	Servo Move Speed	6
26	Route 8 Address	0	68	reserved	-
27	Route 8 Address Adder	0	69	reserved	-
28	reserved	-	70	reserved	-
29	Decoder Configuration	1	71	Servo Behavior	0
30	reserved	-	72	reserved	-
31	Ops Mode Loco Address	1	73	reserved	-
32	reserved	-	74	reserved	-
33	Pwr On State - Servo	2	75	Output Flash	0
34	Pwr On State - Relay	2	76	Input Lockout Address	0
35	reserved	-	77	Input Lockout Address Adder	0
36	Pri Input Control	22	78	Startup delay (x seconds)	-
37	reserved	-	79	reserved	-
38	reserved	-	80	reserved	-
39	reserved	-	81	reserved	-
40	reserved	-	82	reserved	-
41	reserved	-	83	reserved	-
42	reserved	-	84	reserved	-