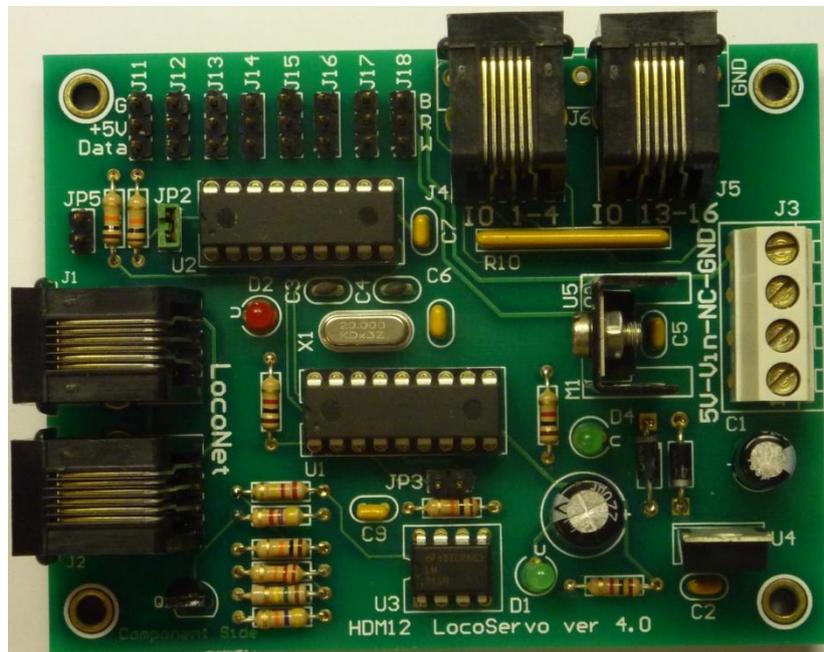


# LocoServo

# User Manual



**HDM12**

**Liability disclaimer:**

Use all items that can be bought and installation instructions that can be found on this site at your own risk. They have been developed for personal use, and I find them very useful. That is why I wish to share them with other model railroad hobbyists. All items and procedures have been tested and used on my own model railroad systems without causing any damage, but this does not necessarily imply that all modifications and procedures will work in any and all environments or systems. I cannot take any responsibility when items or procedures are used under different circumstances. Always use your own judgement and common sense!

# LocoServo Module

This module is a variant of LocoIO. The module can drive 8 analog or digital Servo engines with 2-positions or 4 Servo engines with 4-positions and also includes a LocoIO 8 bits input/output.



- For the 8 bits input/output, see LocoIO user manual.

- The Servo engine can turn in an angle of 110° from Position 1 = 1 to Position 2 = 127. Position 1 and Position 2 can be set within that 110° angle, with a value of 1 to 127. The Servo engines are transferred from one position to the other by means of a "Fixed Contact" report. The transfer can be done at 4 different speeds, and each servo can be set separately. Speed = 0 is the fastest, Speed = 3 is the slow, Speed 6 and 7 are very slow.

- The Servo engine can also perform an ongoing back and forth movement with two different speeds, when the Speed = 4 or 5. In that case, Position 1 is permanently fixed on value = 1. Position 2 can be chosen freely between 1 and 127, and will determine the angle of the movement.

The "Fixed Contact" report determines whether the servo goes back and forth between Position 1 and Position 2 or stays on Position 1.

Continue ongoing back and forth movement is not selectable with selection of 4-position Servo.

With the Servos points/switches, mechanical signals, level crossing barriers, doors of locomotive hangars, etc. ... can be operated.

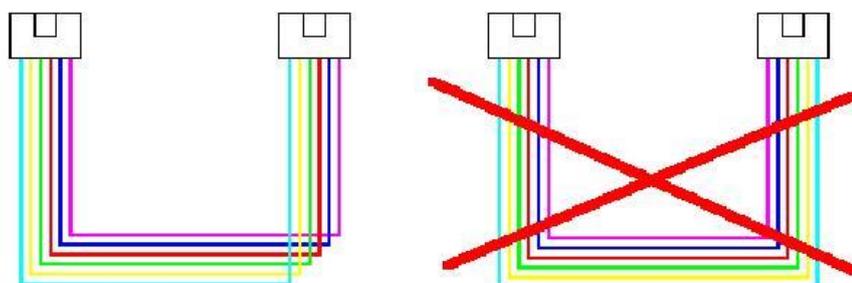
## Software remarks:

- With a **STOP** (OPC\_GPOFF) or **IDLE** (OPC\_IDLE) Loconet command, the current Servo motor positions will be written in a "Power up memory". These positions will be used at the power up of the LocoServo module.

- From software version 107, the 8 output ports are now also written in "Power up memory". This causes the relays used for point polarization to be in the correct position when starting the LocoServo module.

## Driver module connection:

The Connection with Loconet and between LocoServo and Driver Modules is with a 6-wire cable with RJ12 connectors. It is important that on both ends of the cable pin1 on the first connector is connected to pin1 on the second connector.



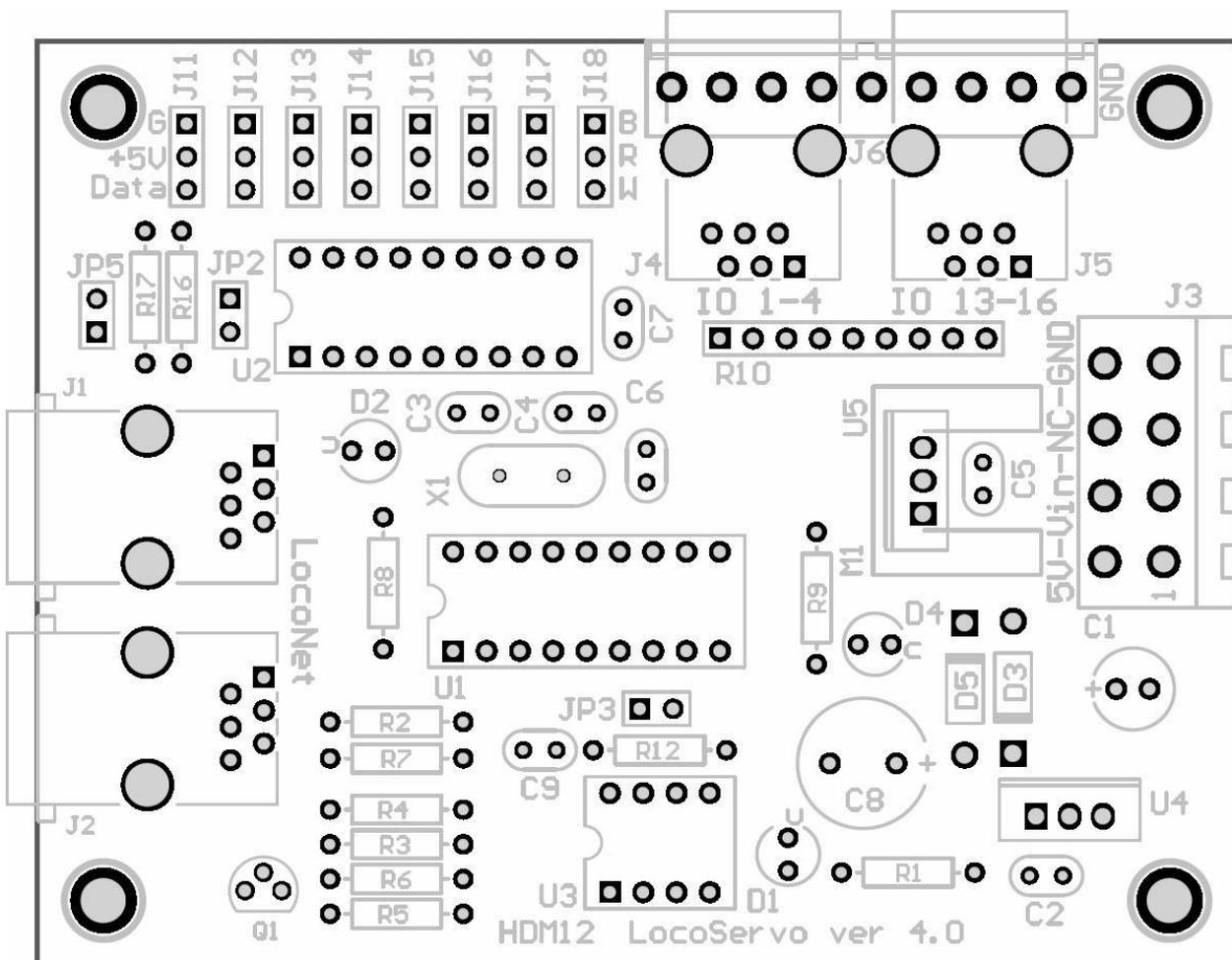
Correct

Wrong



## Bill of materials for the LocoServo module 4.0:

UT_DEVICE	UT_VALUE	Refdes
PCB	HDM12	
IC-socket	18 pins	for U1 and U2
Resistor	1k $\Omega$	R1, R8, R9
Resistor	220k $\Omega$	R2
Resistor	22k $\Omega$	R3
Resistor	10k $\Omega$	R4, R12, R16, R17
Resistor	47k $\Omega$	R5
Resistor	150k $\Omega$	R6
Resistor	4k7 $\Omega$	R7
Resistor Pack	8x10k $\Omega$ (9 pins sil)	R10
Capacitor	100nF	C2, C5, C6, C7, C9
Capacitor	15pF	C3, C4
ELCO	100 $\mu$ F/25V	C1
ELCO	680 $\mu$ F/25V	C8
LED	Green $\varnothing$ 3mm	D1, D4
LED	Red $\varnothing$ 3mm	D2
Diode	1N4001	D3, D5
NPN transistor	BC337-40	Q1
Voltage Regulator	7805	U4, U5
XTAL	Quartz 20MHz	X1
Jumper2	2-pins	JP2, JP3, JP5
HDR_3	3-pins header	JP11, JP12, JP13, JP14, JP15, JP16, JP17, JP18
Connector	RJ12	J1, J2
Connector	4 pins print connector	J3
Comparator IC	LM311N	U3
PIC IC	LS107	U1 on IC-socket
PIC IC	SRV006	U2 on IC-socket
Cool plate	for TO-220 housing	S1
Connector	RJ12	J4, J5 (for HDM12C)
Or		
HDR_9	9 pins print connector (3,81)	J6 (for HDM12D)



## Jumper setting:

JP2 Off The Servo engine is always assisted  
 On The Servo engine is only assisted for 5 sec after a new command has been given.

- When adjusting the drive it is advisable to keep power on the Servo motor.
- Afterwards it is better to put JP2 in closed position. The power supply on the LocoServo is less charged because of this. The Servo motor has with his gear box sufficient force to keep the points in position.

JP3 Off Normal connection to Loconet.  
 On No connection with Loconet.

- When JP3 is On, there is no connection to Loconet. In that case the module is completely independent. On J4 and J5 you will automatically have 8 inputs, where 8 switches can be connected to GND. These serve 8 Servo motors, which are respectively connected to J11 to J18, with the position1 and position2 values. These values need to be written earlier in the module with the LocoIO Configuration program.

JP5 Reserved for later use

## Red LED:

On No central station connected or current source on Locobuffer selected or JP3 On, and Loconet has been disabled because of this.  
 Off Loconet OK, no activity  
 Blinking Loconet command transfer

## Green LED

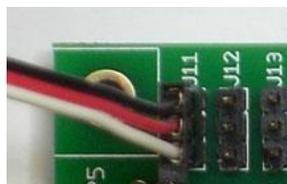
Power OK

## Remarks:

- Every IO pin as output can give max. 20mA.
- With a DC power supply the GND is the same as with an Intellibox or Loco booster.

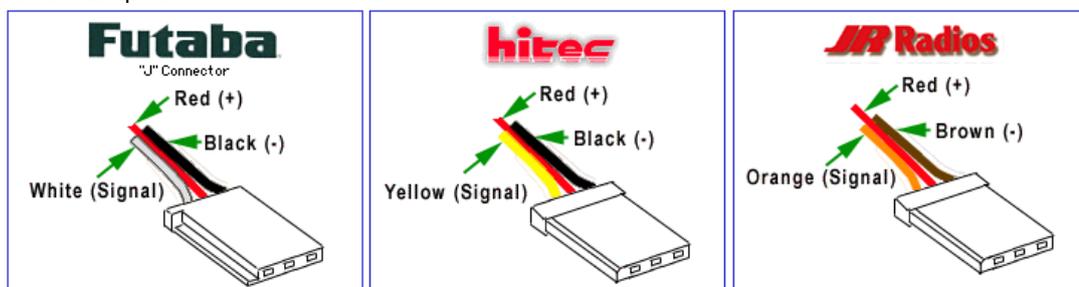
## Servo connectors J11, ... , J18:

Pin1: GND  
 Pin2: +5V  
 Pin3: Signal



**!** Do not make wrong connection or the PIC can be damaged.  
 With 4-positie Servo the connectors J12, J14, J16 and J18 are **not** used.  
 Extend the Servo cable with an extension of a maximum of 80 cm.

Some examples:



**Power connector J3 possibilities:**

**Input:**

- Pin 2: 12V - 15V DC input
- Pin 4: GND input

**Output:**

- Pin 1: 5V output
- Pin 4: GND output

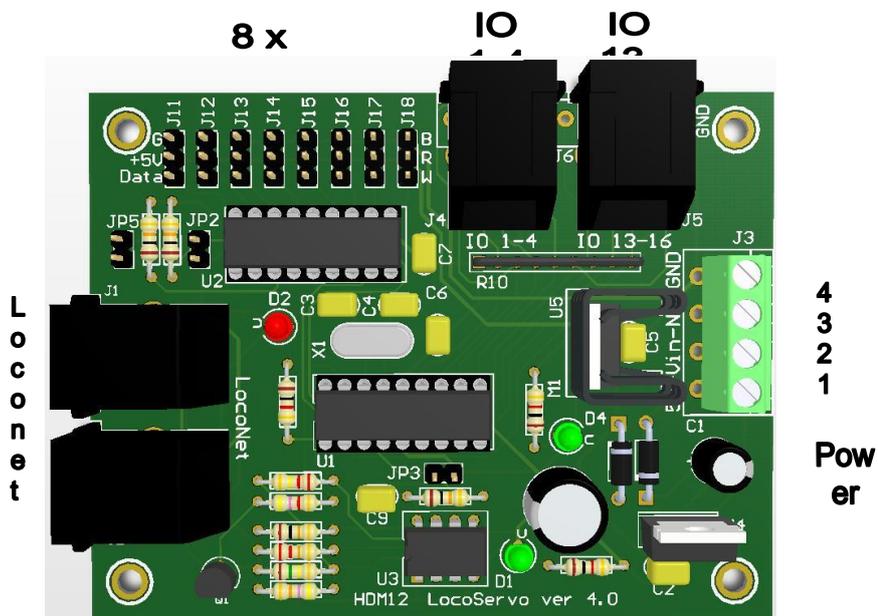
**HDM12C**

**IO connector J4:**

- Pin 1: +5V
- Pin 2: IO-4
- Pin 3: IO-3
- Pin 4: IO-2
- Pin 5: IO-1
- Pin 6: GND

**IO connector J5:**

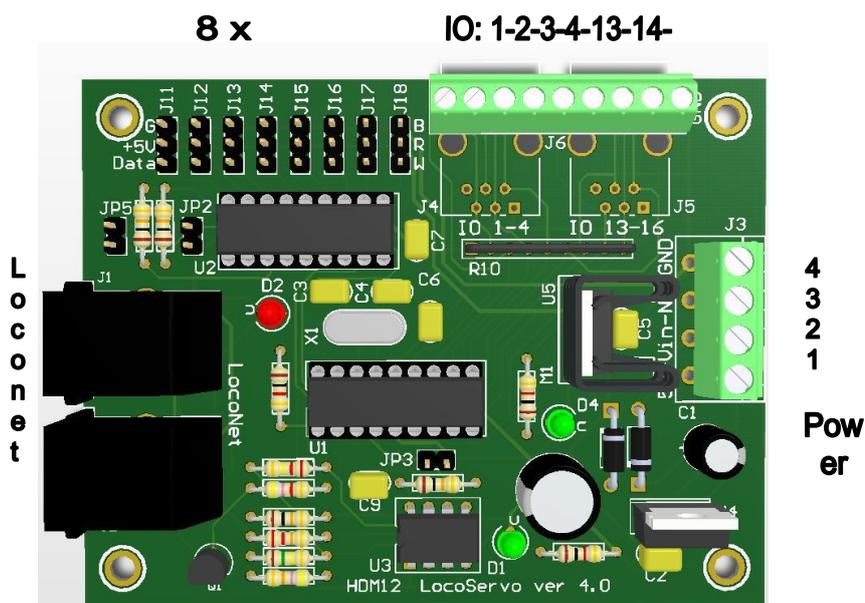
- Pin 1: +5V
- Pin 2: IO-16
- Pin 3: IO-15
- Pin 4: IO-14
- Pin 5: IO-13
- Pin 6: GND



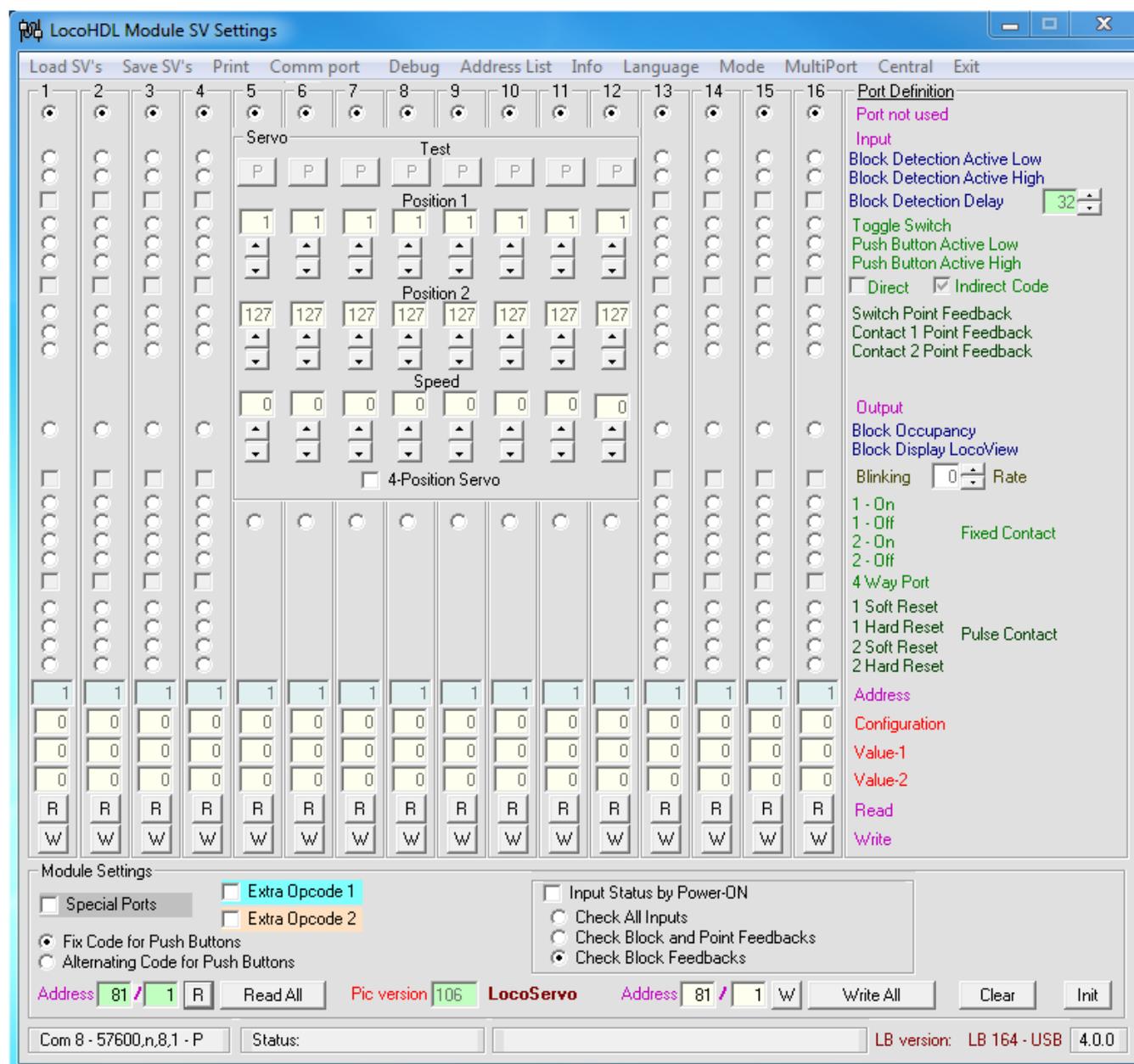
**HDM12D**

**IO connector J6:**

- Pin 1: GND
- Pin 2: IO-16
- Pin 3: IO-15
- Pin 4: IO-14
- Pin 5: IO-13
- Pin 6: IO-4
- Pin 7: IO-3
- Pin 8: IO-2
- Pin 9: IO-1



## LocoHDL Configuration for LocoServo Module



In terms of functionality the first 4 ports are identical to a LocoIO.

### Adjust:

Fill in the addresses of the switch with which the Servos will be controlled.

Set Position 1, Position 2 and a speed.

Write these in LocoServo with the "W" button or "Write All" button.

Both positions can be tested with the test buttons. If necessary change the angle by placing another value in Position 1 and/or Position 2. Each time one value is changed, you must press the "W" button and then with the "L" key to be read, before doing a new test.

### RECOMMENDATION:

- If the used version of LocoServo has not the option selection "Port not used", then it is been advised to define unused ports as output ports, and give them an unused address. Then you prevent that interference on the module will send out undesirable codes on Loconet.
- Give ports used as Servo output, always an address that occurs only once at a module.

Example: 4-positie Servo to work mechanical signals.

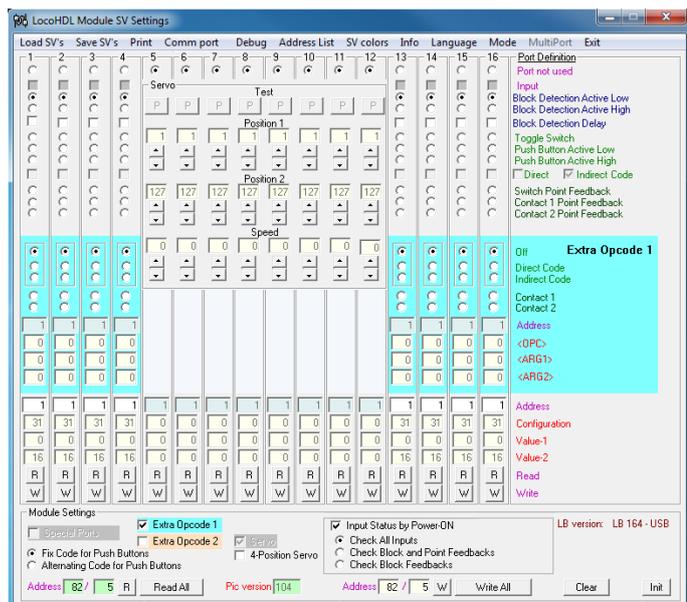
5	6	7	8	9	10	11	12
<input type="radio"/>							
Servo				Test			
P	P	P	P	P	P	P	P
Pos1	Pos3	Pos1	Pos3	Pos1	Pos3	Pos1	Pos3
1	81	1	76	1	64	1	47
▲	▲	▲	▲	▲	▲	▲	▲
▼	▼	▼	▼	▼	▼	▼	▼
Pos2	Pos4	Pos2	Pos4	Pos2	Pos4	Pos2	Pos4
60	127	40	127	64	127	127	102
▲	▲	▲	▲	▲	▲	▲	▲
▼	▼	▼	▼	▼	▼	▼	▼
Speed							
0	0	1	1	2	2	3	3
▲		▲		▲		▲	
▼		▼		▼		▼	
<input type="radio"/>							
100	101	102	103	104	105	106	107
128	128	128	128	128	128	128	128
99	100	101	102	103	104	105	106
16	16	16	16	16	16	16	16
R	R	R	R	R	R	R	R
W	W	W	W	W	W	W	W

The Servo to J11 have as Position1 = 1, Position2 = 60, Position3 = 81, Position4 = 127, speed = 0  
Addresses used for the operation are 100 and 101.

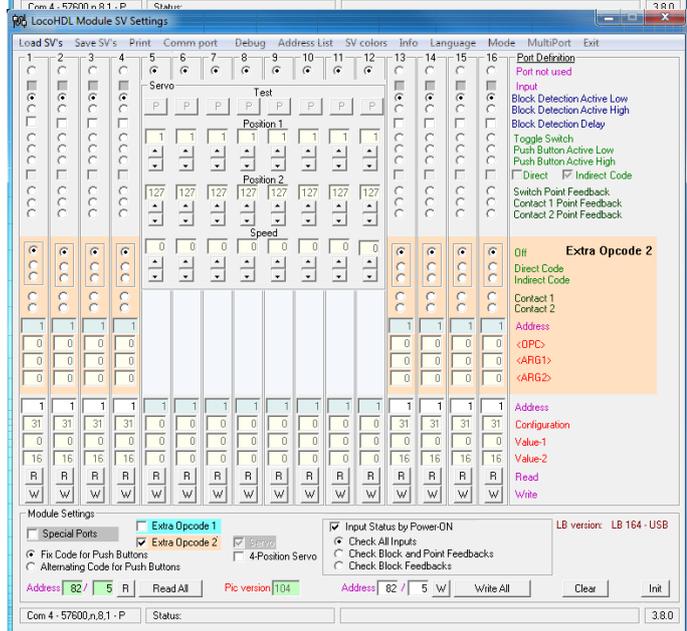
The Servo to J13 have as Position1 = 1, Position2 = 40, Position3 = 76, Position4 = 127, speed = 1  
Addresses used for the operation are 102 and 103.

The Servo to J15 have as Position1 = 1, Position2 = 64, Position3 = 64, Position4 = 127, speed = 2  
Addresses used for the operation are 104 and 105.  
Here it concerns 3-position signal Position2 = Position3.

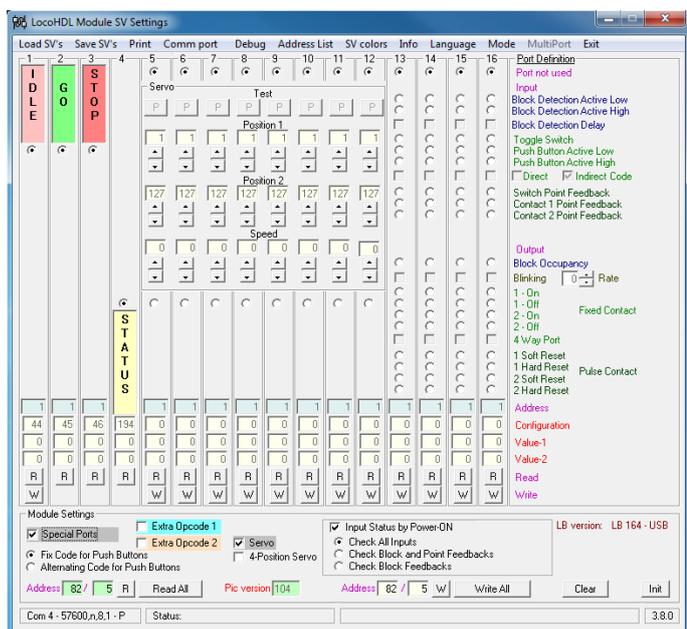
The Servo to J17 have as Position1 = 1, Position2 = 127, Position3 = 47, Position4 = 102, speed = 3  
Addresses used for the operation are 106 and 107.



The LocoServo also has an “Extra Opcode” setting



As from LocoServo Software version 103 you have also “Extra Opcode 2” possibility.



As from LocoServo Software version 103 you have also a “Special Ports” possibility.

Further information about this can you find in the LocoHDL configuration manual.

## History of the hardware versions

### Version 1.0

- Start version

### New in version 2.0

- Adaptations in the power circuit for better stability

### New in version 3.1

- With 8 inputs/outputs (port 16 only as input)

### New in version 4.0

- With 8 inputs/outputs
- Choice between 2x RJ12 or header for inputs/outputs

## History of the software versions

### Version 101 (LS101 + SRV001)

- Start version

### New in version 102 (LS102 + SRV001)

- New bigger PIC for U1 - PIC16F648A (the PIC16F628A was too small for this version)
- 4-position servo

### New in version 103 (LS103 + SRV001)

- Extra Opcode 2
- Special Ports for GO-IDLE-STOP inputs and STATUS output.

### New in version 104 (LS104 + SRV002 for hardware 3.1)

- With 8 inputs/outputs
- LS104 + SRV001 for hardware 1.0 and 2.0

### New in version 105 (LS105 + SRV004 for hardware 4.0)

- LS105 cannot be used on older versions of hardware.
- SRV004 has additional speed setting 7 and 8 for very slow movements.
- These new speeds are adjustable from LocoHDL version 3.9.5

You can replace a SRV002 by SRV004 if you want to use the speed setting 7 and 8.  
You can replace a SRV001 by SRV003 if you want to use the speed setting 7 and 8.

### New in version 106 (LS106 + SRV004 for hardware 4.0)

- Adjustable Block Detection Delay
- Supported LocoNet command OPC\_SW\_ACK, switching accessories with confirmation.

### New in version 107 (LS107 + SRV004 for hardware 4.0)

- Bug fix of port 16 in some versions of LS106
- From software version 107, the 8 output ports are now also written in "Power up memory". This causes the relays used for point polarization to be in the correct position when starting the LocoServo module.

### New in version SRV006 (LS104 + SRV006 for hardware 3.x) (LS105/LS106/LS107 + SRV006 for hardware 4.0)

- Bug fix on power outage after 5 seconds at some speeds not working properly.
- The Servo motor can now rotate in a larger angle of 110°

### Compatibility issue

We have discovered recently a compatibility issue between older and newer generation PICs. I first used for LS10x a PIC16F648A and for SRV00x a PIC16F628A (or PIC16F648A). I changed it to a new generation, which is easier to program, has more stability, etc... Now I use for LS10x a PIC16F1827 and for SRV00x a PIC16F1826 (or PIC16F1827). Tests show that the old and new do not work well together or not at all.