ConLAB

DCC-8

DIGITAL TO EIGHT CURRENT LOOP CONVERTER

OPERATING MANUAL

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1. *MOUNTING INSTRUCTIONS*

The DCC-8 is designed be mounted on standard DIN rail.

Place the unit on the upper part of the mounting rail with the fastening tab facing down. Loosen the tab slightly, using a suitable flat screwdriver, and attach the unit to the rail. After releasing the tab, make sure that the unit is fastened securely in place.

2. *FUSE REPLACEMENT*

In order to replace a blown fuse, the unit has to be disassembled, as follows:

2.1 Take off both terminal strips by removing the four screws at the edges.

Note: This does not require disconnecting the cables connected to the strips.

2.2 Remove the front panel using a suitable flat screwdriver. Press down gently on the plastic spring-loaded tabs located in the slots on either side of the unit.
2.3 Disconnect the flat connector which connects the front panel.
2.4 Replace the blown fuse.

WARNING: Never install a fuse rated more than 800mA.

3. *ASSEMBLING THE UNIT*

The DCC-8 unit includes two printed circuit cards designated as P.N 7041 and P.N 7040. The two printed circuit boards should occupy the slots in the enclosure according to fig 1.

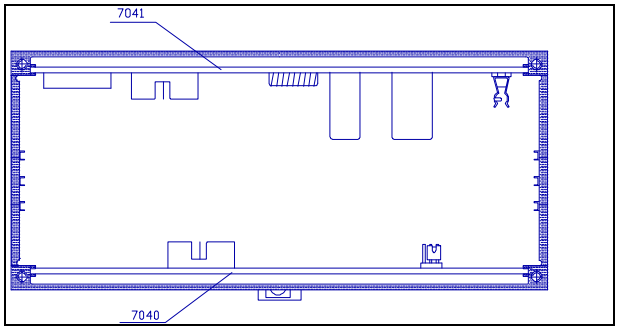

Figure 1

3.1 *Assembling Procedure*

Insert the two printed cards into their slots. Connect the flat cable between them. Connect the front panel flat cable. The panel must be inserted into the grooves on both sides of the case while pressing down until a distinct "click" is heard. Assembly is completed by laying the terminal strips in place. Note: Because of their polarity, the terminal strips must not be placed backwards.

4. *SUPPLY VOLTAGE*

The DCC-8 is fed by a DC power supply at a range of 15-32 Vdc. In order to determine the minimum supply voltage, use the following equation:

$$V_{min} = 8 + R_{load} * 0.02$$

where:

V_{min} is the minimum required supply voltage (e.g. 15V).

R_{load} is the maximum output load including the leads resistance.

Note: If V_{min} turns to be less than 15V, the minimum required voltage should be 15 Vdc.

5. *MODES OF OPERATION*

The DCC-8 unit can be operated in four modes of operation.

- 4-20 or 0-20mA output current selection
- Parallel control mode
- Serial control mode
- Self test mode

An internal array of 8 dip-switches determines the selected mode of operation.

5.1 *0-20 or 4-20mA Output Current Selection*

Two current output spans are available: 4-20mA or 0-20mA. SW-6 selects between the two spans.
The DCC-8 receives 12 bit data which determines the output current value. Channel data value of 4095 (FFF) is always interpreted as a 20mA output current. Channel data value of 0 (000) will produce a 0mA output current when SW-6 is OFF, or 4mA when ON.

Switch Setting Table

	S1	S2	S3	S4	S5	S6	S7
PARALLEL 0-20mA	OFF	OFF	X	X	X	OFF	OFF
PARALLEL 4-20mA	OFF	OFF	X	X	X	ON	OFF

5.2 *Parallel Control Mode*

Switch Setting Table

	S1	S2	S3	S4	S5	S6	S7
PARALLEL 0-20mA	OFF	OFF	X	X	X	*	OFF
PARALLEL 4-20mA	OFF	OFF	X	X	X	*	OFF

5.3 *Serial Control Mode*

Switch Setting Table

	S1	S2	S3	S4	S5	S6	S7
300 BPS	OFF	OFF	UNIT ID CODE			ON= 4-20mA	ON
4800 BPS	ON	OFF	UNIT ID CODE				ON
9600 BPS	OFF	ON	UNIT ID CODE			OFF=0-20mA	ON
19200 BPS	ON	ON	UNIT ID CODE				ON

SW-5 =MSB

5.4 Self Test Mode

Switch Setting Table

	S1	S2	S3	S4	S5	S6	S7
SELF TEST #1	ON	OFF	X			X	OFF
SELF TEST #2	OFF	ON	X			*	OFF
SELF TEST #3	ON	ON	X			*	OFF

* according to para #5.1

6. ***PARALLEL CONTROL MODE***

	S1	S2	S3	S4	S5	S6	S7
PARALLEL MODE	OFF	OFF	X			*	OFF

* according to para #5.1

In the parallel control mode, the DCC-8 unit is controlled via a 15 bit bus. 3 Address bits (A0-A3) select the proper current output channel and 12 Data bits (D0-D11) determine its value (A0 and D0 are MSB).
The DCC-8 microprocessor continuously scans the input vector terminals and updates its memory tables as soon as it recognizes new vector. The unit is asynchronous in nature. The data should be valid for at least 160 micro-seconds.

6.1 *Parallel Mode - PLC Interface*

The PLC's output modules can be divided into three popular types; TTL output module, 24Vdc sink type and 24Vdc source type.
There is a jumper selector on printed circuit card 7040 which selects between Sink/Source input. (TTL output module should be consider as sink type).
See figure 2.

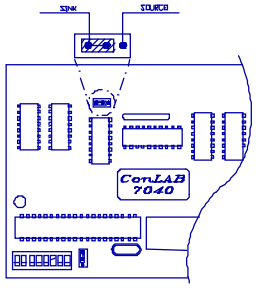

Fig. 2

6.2 *The "E" (ENABLE) Terminal*

For E = "1" the unit is enabled, which means that all input vectors are received and the output is updated. When E="0" the unit ignores any new input vectors. The E terminal is recommended to be used as a strobe for parallel data which has a long setup time. In this case the following sequences recommended: prior to applying a new vector, the E terminal should be set to logical 0 (inhibit state) then the new input vector should be imposed. When the data is ready - the E terminal should be pulsed.
The E terminal is used for multi-drop configuration. The 15 bit vectors are applied to the units in parallel to all units and the selection is carried out by controlling the "E" inputs.

7. SERIAL CONTROL MODE

7.1 *RS-232c/RS-422 Select*
The DCC-8 is equipped with two serial communication ports: The RS-232c and the RS-422. A jumper switch at the right side of the dip-switch array is used to select the required communication protocol. See figure 3.

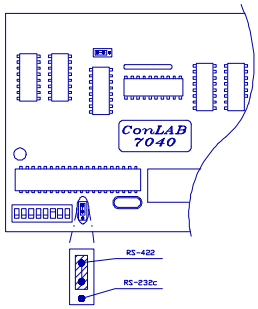

Fig. 3

7.2 *RS-422 Termination*

S.W. #8 when ON, inserts 100Ω terminator resistor to the RS-422 transmission line.
In a multi-drop configuration, the most far DCC-8 unit should be terminated in order to match the transmission lines.

Note: Only one termination load per RS-422 communication link is permissible.

7.3 *Serial Control Switch Settings*

S1	S2	S3	S4	S5	S6	S7
BAUD RATE		ID CODE			*	ON

* according to para #5.1

7.4 *Serial Communication Parameters*

The communication protocol is:

Data: 8-bit,
Parity: even
Stop bit: one

7.4.1 *Baud Rate Select*

SW-1 and SW-2 select one out of four available baud rates.

	SW1	SW2
300 BPS	OFF	OFF
4800 BPS	ON	OFF
9600 BPS	OFF	ON
19200 BPS	ON	ON

7.4.2 *DCC-8 ID Code*

Up to eight DCC-8s can be connected in a multi-drop configuration. Switches SW-3, SW-4, and SW-5 (SW-5 is MSB) set the ID code.

7.4.3 *DCC-8 Command Formats*

Three types of command formats are available:

- Without echo-back
  The host computer sends a massage and does not receives an acknowledgment.

- With echo-back
  The host computer sends a message and receives an acknowledgment stating the DCC-8 ID number and the addressed channel number.

- Status report

7.4.3.1. *Without Echo-Back Format*

[A] [DCC-8 ID CODE] [CHANNEL NUMBER] [CHANNEL VALUE] [CR]

The first byte is the character "A". It begins the command block.
The second byte is the ID code (0-7). The third byte is the addressed channel number (0-7). Up to four bytes of a channel's value can be in BCD mode (0-4095). Leading zeroes can be omitted. The last byte is [CR] which must terminate the command block.

7.4.3.2. *With Echo-Back Format*

[C] [DCC-8 ID CODE] [CHANNEL NUMBER] [CHANNEL VALUE] [CR]

This format differs only in the opening character. After every command block transfer, the DCC-8 echoes back the following:

[C] [DCC-8 ID CODE] [CHANNEL NUMBER] [LF] [CR]

Note: If the value is omitted it will be treated as zero. Separators such as blanks or commas are not allowed.

Example:

Channel 4 in DCC-8 no. 7 has to receive the value of 981. Echo back is required

The command format is:

[C] [7] [4] [981] [CR]

The echo back will be: C 7 4

Note: The channel numbers on the DCC-8 front panel are designated from 1 to 8, in binary they are designated from 0 to 7.
Note: When applying the echo-back mode, it is advisable to wait for the echo back before transmitting a new command.

7.4.3.3 *Status Report Format*

[S] DCC-8 ID CODE] [CR]

The addressed DCC-8 unit will respond with the values stored in its eight channels. The response will start with S, DCC-8 ID CODE, following with eight channel values separated with commas and [LF] [CR] as terminators.

Example

DCC-8 number 3 has the following stored data: ch1: 300, ch2: 1270, ch3: 0, ch4: 4087, ch5: 2099, ch6: 764, ch7: 3078, ch8: 550. The response from the device will be:

S3,300,1270,0,4087,2099,764,3078,550 [LF] [CR].

Note: Wait until the status report has terminated before transmitting new commands.

8. *SELF TEST*

The DCC-8 is provided with three test modes.

	S1	S2	S3	S4	S5	S6	S7
SELF TEST #1	ON	OFF	X			X	OFF
SELF TEST #2	OFF	ON	X			*	OFF
SELF TEST #3	ON	ON	X			*	OFF

* according to para #5.1

8.1 *Self Test #1 (Communication Ports Test)*

In order to test the serial communication ports, this test mode converts the unit to a transponder for ASCII characters. Any transmitted character will be echoed to the host terminal. The host parameters should be set to:

Baud rate : 4800
Data: 8 bits
Parity: even
Stop bit: 1

8.2 *Self Test #2 (Same Level)*

In this test mode, the DCC-8 unit ignores the address field. All the outputs are set according to the data field only.

8.3 *Self Test #3 (Saw Tooth)*

In this test mode, only one output channel (according to the address setting) will produce a saw tooth wave form in which the whole value range is used.

9. *MULTIDROP CONFIGURATION*

Up to eight DCC-8 units can be installed in a multi-drop configuration using the RS-422 communication port. All the (DCC-8) RS-422 receiver (Rx) terminals are connected to the controller's RS-422 output driver, while all the (DCC-8) RS-422 transmitter (Tx) terminals are connected to the controller's RS-422 receiver. As the communication cable might be several thousand feet long, it is necessary to terminate the end of the line with its characteristic impedance in order to avoid reflections in the transmission line and data distortion. SW-8 in its ON state terminates the Rx inputs with a 100Ω load.

10. *PUTTING THE UNIT INTO OPERATION*

The DCC-8 is supplied configured to parallel control mode. The dip-switch setting is:

	S1	S2	S3	S4	S5	S6	S7
PARALLEL 4-20mA	OFF	OFF	OFF	OFF	OFF	ON	OFF

The communication port selector (see para #7.1) is set to RS-232C.

1. First determine the required configuration.
2. Disassemble the unit in order to set the dip-switch array accordingly (see instructions in para #5).
3. Connect the unit to the supply.

The channel LED's are connected in series with the output current so that they will light only when the output current is flowing, indicating the existence of a closed current loop.
The DCC-8 stores the last updated value of output current in its memory. As long as no power failure has occurred, no restoring is needed. However, in the serial control mode it is possible to monitor the unit's memory by using the "Status Report" command.
After every power on, the unit is reset and the initialized default output currents are according to SW-6 setting (see para #5.1).

11. ***DCC-8 CALIBRATION***

Generally there is no need to calibrate the DCC-8 unit. However if calibration is required, please follow the following instructions. Two potentiometer trimmers, one for "Zero" and the other for "Span" are located on printed card 7040. The trimmer which is close to the card edge is the "Zero". Use the following switch setup for switching the outputs between 4 and 20mA.

	S1	S2	S3	S4	S5	S6	S7
ALL CH.= 4mA	OFF	OFF	X	X	X	ON	OFF
ALL CH.= 4-20mA	OFF	ON	X	X	X	ON	OFF

Step 1:

Select one channel (for example ch.#1) for the initial tuning. Set the dip-switch array to "all - 4mA". Apply supply voltage to the unit. The initial state of all the output currents is 4 mA. Use SW-2 to toggle the outputs between 4 and 20mA.

Step 2:

Monitor all the 8 channels in 4mA state, and calibrate the Zero trimmer so that the average readings is 4.000mA. Then repeat for 20mA state, and calibrate the Span trimmer so that the average readings is 20.000mA This procedure should be repeated until calibration is satisfactory.

SPECIFICATIONS

INPUTS:	Parallel & Serial control inputs
PARALLEL INPUTS:	3 - Output current loop address 12 - Output current value (Data) 1 - Enable (E)
LOGIC LEVELS:	0<"0"<0.4V, 3<"1"<40V
DATA HOLD TIME:	150 microsecond
MAXIMUM PARALLEL INPUT RATE:	6000 updates per second
SERIAL COMMUNICATION:	RS-232c full duplex RS-422 full duplex
BAUD RATES:	300, 4800, 9600, 19200 bps
PARITY:	Even
STOP BIT:	One
STATUS REPORT:	Reports as interrogated
MULTI-DROP CAPABILITY:	Up to eight units
OUTPUTS:	8 continues current loops
OUTPUT CURRENT SPAN:	0-20mA or 4-20mA (user selected)
OUTPUT CURRENT SETTLING TIME:	4.2 ms max. for 99.3% of step
POWER SUPPLY:	15-32 Vdc (regulated)
CURRENT CONSUMPTION:	85mA max.
MAXIMUM LOOP RESISTANCE:	According to Rmax (Kohm)= (Vsupply -6)/20
ACCURACY:	±0.1% of span typical, ±0.2% of span max.
RESOLUTION:	±0.025% of span typical, ±0.05% of span max.
INDICATORS:	Yellow Power-On LED 8 Red output channel LED’s

AMBIENT TEMPERATURE:	
Operation:	0 to 55°C
Storage:	-25 to +85°C
RELATIVE HUMIDITY:	5 to 95%, non-condensed
HOUSING:	Plastic polycarbonate
BOX:	According to IP 50 DIN 40050
TERMINALS:	According to IP 20 DIN 40050
MOUNTING:	Standard DIN rail
FUSE:	630mA fast blow
WEIGHT:	0.7Kg
DIMENSIONS (mm):	200(W) x 73.2(H) x 121(D)

data subject to change without notice