Building Instructions.

Issue 2

These are the Building Instructions for 8-channel DCC-TOTI (Train-On-Track-Indicator) Input Module (DCC-TOTI) which is used to monitor the presence of trains on up to 8 rail sections. It is designed for easy interfacing to a CAN-ACE8C for CBUS systems. Do take a few minutes to read right through these Instructions before commencing assembly and begin by checking through the kit contents. If any items are missing please contact the Kitmaster. These instructions refer to Rev 1.01 of the printed circuit board (PCB).

Static Precautions are vital when handling the Integrated Circuits, which should be left in their protective tubes until instructed to install.

Circuit Diagram



Assembly starts with the smallest items first to allow the pcb to lie flat on the bench when soldering the underside. Do not attempt to solder the diodes on the reverse until the top components are fitted.



Fit the 8 1K0 Resistors (Marked 102 or 1001)

Fit the 8 1K5 Resistors (Marked 152 or 1501)

Fit the 8 4K7 Resistors (Marked 472 or 4701)

Fit the 2 22K Resistors (Marked 223 or 2202)

Fit the 16 100K Resistors (Marked 104 or 1003)

Fit the 12 100n Capacitors (Normally unmarked; may be fitted either way around)

Fit the 4u7 Capacitor (Normally unmarked; may be fitted either way around)

Fit the 8 LED's, taking care not to melt the plastic. They must be fitted with the green dot (or similar) at the **opposite** end to the + symbol shown in the layout.

Fit the 8 LL4148 Diodes. These MUST be fitted with the black band in the direction shown.

At this stage, do a quick visual check that all components are correctly soldered and there are no bridges between tracks.

Fit the 4 LM339SM integrated circuits with the 'notch' on one end of the chip corresponding to the layout. Fit the 2 ACPL-247-500 optocouplers with the 'notch' on one end of the chip corresponding to the layout. These are best fitted by solding two legs at opposite corners, checking for correct registration, then soldering the remaining pins, being careful to not cause any solder bridges between the pins.

Fit the 9 B340 Diodes. These MUST be fitted with the white band in the direction shown.

At this point, fit the 8 B340 diodes on the bottom of the board. These should be fitted with the white band towards the adjacent connector.

Again, do a quick visual check that all components are correctly soldered and there are no bridges between tracks.

Now assemble and fit J1.

Check the PCB looks similar to these photographs:



Fit J2 **unless** a direct connection to a CAN-ACE8C is used (see below)

Testing

Connect the DCC-TOTI to DCC tracks as shown below. Note that one side of the tracks MUST be common. The polarity of the DCC feed is unimportant.



Do not connect anything to J2 at this stage.

Power up the system and check that none of the LED's are lit.

Connect a voltmeter across C14 and check for around 12V – though note that this voltage will vary depending on the peak voltage of the DCC feed used. Check that the voltage on R5 and R6 is approximately 6V, or half of the voltage across C14.

Put a train on each track in turn, and check that the appropriate LED is illuminated. A damp finger across the tracks can also be used for testing. Check that the LED isn't illuminated when the train is removed.

Connect J2 to the input module and repeat the tests, checking that each input is correctly asserted when a train is on each track.

Direct Connection to CAN-ACE8C

The DCC-TOTI board has been designed for direct connection to a CAN-ACE8C board. To do this, **don't** fit terminal blocks to J2 on the CAN-ACE8C or to J2 on the DCC-TOTI, but instead use a 10 way right angle 0.1" header, suitably bent, to link J2 on the DCC-TOTI board to the 0.1" holes by J2 on the CAN-ACE8C.

Kit Contents

Component	Value	Description	Qty	Parts	Supplier	Part Number
10PinCon		Molex	1 J2		Rapid	22-0850 / 22-0832
B340		Shtky Diode	17		Farnell	1456529
Candem11way		Terminal Strip	1 J1		Rapid	3*21-3001 + 1 *21-3000
CP-SM	4u7	Ceramic Cap	1 C14		Rapid	71-0516
CP-SM	100N	Ceramic Cap	12 C1-C13		Rapid	71-2024
LED_SM	LED RED	LED 0805	8 L1-L8		Rapid	72-8558
LL4148		Silicon Diode	8 D3,6,9,12	,14,16,20,22	Rapid	47-2386
LM339SM		Quad Comparator	4 U1-U4		Rapid	82-0244
ACPL-247-500		Opto Coupler	2 U5, U6		Farnell	163-4758
R-SM	1K0	Resistor	8 R1,8,13,2	0,17,2833,38	Rapid	72-0217
R-SM	1K5	Resistor	8 R7,12,19,	24,27,32,37,42	Rapid	72-0227
R-SM	4K7	Resistor	8 R3,10,15,	22,25,30,35,40	Rapid	72-0257
R-SM	22K0	Resistor	2 R5,6		Rapid	72-0297
			R2,4,9,11	,14,16,21,23		
R-SM	100K0	Resistor	16 R18,26,29	9,31,34,36,39,41	Rapid	72-0337
PCB			1		MERG	968

Note that TS4148 diodes can be used instead of LL4148. These are in a rectangular package and are much easier to fit. The Rapid part number for these is 47-1004.

4 Channel Option

If less tracks need to be monitored, build the 4 channel version. This uses the same PCB but only fit the components shown below:



If the 4 channel option is used with a CAN-ACE8C board, inputs 1..4 are still available.