



Australian Government
Department of Industry,
Innovation and Science

National Measurement Institute

Supplementary Certificate of Approval No S414

Issued by the Chief Metrologist under Regulation 60
of the
National Measurement Regulations 1999

This is to certify that an approval for use for trade has been granted in respect of the instruments herein described.

Transponder Technologies Model T5 Calculator/Indicator for Fuel Dispensers for Motor Vehicles

submitted by Transponder Technologies Pty Ltd
2 Hamra Drive, Export Park
Adelaide Airport SA 5950

NOTE: This Certificate relates to the suitability of the pattern of the instrument for use for trade only in respect of its metrological characteristics. This Certificate does not constitute or imply any guarantee of compliance by the manufacturer or any other person with any requirements regarding safety.

This approval has been granted with reference to document NMI R 117 Measuring Systems for Liquids Other than Water, dated June 2011.

This approval becomes subject to review on **1/04/21**, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variant 1 approved – interim certificate issued	12/03/03
1	Variant 2 provisionally approved – interim certificate issued	25/07/03
2	Pattern & variant 1 approved – certificate issued	12/08/03
3	Variant 2 approved – interim certificate issued	16/02/04
4	Variants 2 & 3 approved – certificate issued	12/08/04
5	Variant 4 approved – interim certificate issued	16/09/04
6	Variant 4 approved – certificate issued	27/10/04
7	Variants 5 & 6 approved – certificate issued	31/03/08
8	Variant 8 provisionally approved – interim certificate issued	21/09/09

Document History (cont...)

9	Pattern & variants 1 to 6 reviewed – variant 7 approved – certificate issued	8/10/09
10	Variant 8 approved – certificate issued	5/11/10
11	Variant 9 approved – interim certificate issued	22/12/15
12	Pattern & variants 1 to 8 updated & reviewed – variant 9 approved – certificate issued	26/02/16

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI (or NSC) S414' and only by persons authorised by the submitter.

Instruments incorporating a component purporting to comply with this approval shall be marked 'NMI (or NSC) S414' in addition to the approval number of the instrument, and only by persons authorised by the submitter.

Auxiliary devices used with this instrument shall comply with the requirements of General Supplementary Certificates No S1/0/A or No S1/0B.

Signed by a person authorised by the Chief Metrologist to exercise their powers under Regulation 60 of the *National Measurement Regulations 1999*.



Dr A Rawlinson

TECHNICAL SCHEDULE No S414

1. Description of Pattern

approved on 12/03/03

The pattern is a Transponder Technologies model T5 calculator/indicator interfaced to an Email Electronics model VN pulse generator or any other NMI-approved measurement transducer generating compatible (#) pulse output proportional to volume throughput. The instrument is mounted in a suitable enclosure and retrofitted to a compatible NMI-approved fuel dispenser for motor vehicles.

(#) 'Compatible' is defined to mean that no additions/changes to hardware/software are required for satisfactory operation of the complete system.

1.1 Field of Operation

The field of operation is determined by the following characteristics:

- Operating air temperature: -10°C to 55°C
- Power supply range: 204 V to 264 V AC
- Maximum input frequency: 94 Hz per channel (two channel input)
- For use in interruptible metering systems (fuel dispensers) with the first 40 mL suppressed.

1.2 Indicator

The indicator comprises 3 separate displays (Figure 1); two 25 mm six-digit liquid crystal displays (LCD) for displaying the price and volume, and one 25 mm four-digit LCD for displaying the unit/price. The indicators display the following values:

Price Up to \$9999.99 in \$0.01 increments

Volume Up to 9999.99 L in 0.01 L increments

Unit price Up to 999.9¢/L in 0.1 ¢ increments

In attended-operated mode, electronic totals for price and volume can be displayed by pressing the nozzle switch five times in quick succession.

A separate electro-mechanical totaliser is provided to display the accumulated volume up to 9 999 999 litres.

The software version number is 01211.

1.3 Checking Facilities

An automatic segment test is performed at the start of each delivery.

The calculator monitors the presence and correct transmission of signal from the measurement transducer, and in the event of detecting a fault the instrument indicates an error code and has provision for controlling electrically-operated valves to stop the delivery.

1.4 Configuration

The parameters and modes of operation of the instrument are set via two configuration switches marked 'SW1' and 'SW2' mounted on the processor board (Figures 2 and 3). Switch SW2 must be sealed.

The following functions/settings are available:

FActr – meter calibration adjustment
PCut – full flow to low flow switching for pre-set delivery
S FLO – time out before start of delivery
E FLO – time out when flow stopped
Sd – submersible pump delay
CFg a – mode of operation – e.g. pump communication protocol, pulser type
CFg b – mode of operation – e.g. monitor gas detection, back light intensity
CFg P – mode of operation – stand-alone
codE – software version number
PricE – unit price setting
cdE – displays diagnostic message
Pu nu – pump number
Id En – identifier for use with Itotes mode

1.5 Unit Price Setting

Unit price is changed by means of a parameter push-button (marked 'SW1') which is located in the calculator processing circuit board. The unit price may also be changed remotely when interfaced to a compatible Commission-approved fuel dispenser selfservice control device.

1.6 Calibration Adjustment

The instrument incorporates an electronic calibration facility for adjusting the calibration of the measurement transducer and is accessible via the calibration push-button 'SW2' on the calculator processing board. Switch SW2 must be sealed.

The range of the calibration factor is 0.0001 to 99.9999 and is used by the calculator to multiply the number of pulses received from the measurement transducer. To adjust the calibration of the measurement transducer, the calibration factor is determined using the following equation:

$$\text{new calibration factor} = \text{current factor} \times (\text{measured volume}/\text{displayed volume})$$

The calibration factor can be viewed and changed as follows:

- (a) Ensure that the nozzle is hung up.
- (b) Use the push-button switch SW2 to indicate the calibration parameter 'FActr' in the price display and the actual factor is indicated in the volume display.
- (c) Press and release switch SW2 in quick succession, until the desired decimal place is reached.
- (d) Holding down the push-button will cause the selected digit to increment; when the desired digit is displayed, release the push-button.
- (e) Repeat steps (c) and (d) until the desired calibration factor is displayed.

1.7 Pulse Generator

The Transponder Technologies model 082230 pulse generator (Figure 4) is a dual channel pulse output device, each channel producing 25 pulses per shaft revolution. The pulse generator can be rotated at a maximum of 225 revs/min.

When the shaft of the pulse generator is rotated once, the T5 indicator displays a volume of 1.00 litres when the calibration 'Factr' is set to 4.0000.

1.8 Power Supply

The instrument requires a Transponder Technologies power supply unit (Figure 5) which converts the 240 V AC power supply to the required voltage for the T5 calculator/indicator.

1.9 Provision for Verification Mark

Provision is made for the application of a verification mark.

1.10 Provision for Sealing

The electronic calibration switch SW2 located on the calculator processing board (Figures 2 and 3) has provision for sealing with lead and wire.

1.11 Descriptive Markings and Notices

Instruments are marked with the following data, together in one location:

Manufacturer's name or mark	Transponder Technologies Pty Ltd
Model number	T5
Serial number
Pattern approval mark	NMI (or NSC) No S414
Year of manufacture
Environmental class	N

The minimum measured quantity specified for the fuel dispenser is marked on the face of the indicator in the form 'Minimum Delivery 2 L'.

2. Description of Variant 1

approved on 12/03/03

The pattern may be interfaced to a compatible (#) NMI-approved fuel dispenser self-service control system via a communication protocol converter. The approved Transponder communication protocol converters for the model T5 calculator/indicator are:

- Email (Figure 6);
- Gilbarco (Figure 7); and
- New Zealand (Figure 8).

The Email protocol converter is located in the vicinity of the displays of the T5 calculator/indicator, whereas the Gilbarco and New Zealand converters are integral with the circuit boards located in the power supply unit (Figures 7 and 8).

(#) 'Compatible' is defined to mean that no additions/changes to hardware/software are required for satisfactory operation of the complete system.

3. Description of Variant 2 **approved on 16/02/04**

The Transponder Technologies model T5b calculator/indicator is similar to the model T5 of the pattern but with modified electronics (Figures 9 and 10).

The instrument may be interfaced to a Transponder Technologies model TTMRT-86 pulse generator replacing the pulse generator described for the pattern.

The instrument is approved with software version No 01214.

The instrument may be interfaced to the protocol convertors described for the pattern and variant 1.

Note that the SW3 switch is disabled.

4. Description of Variant 3 **approved on 11/08/04**

The Transponder Technologies model T5-FLR calculator/indicator which has a single display for indicating volume only (Figure 11).

The instrument uses the same electronics as Variant 2 (Figure 10).

The instrument may be interfaced to a Transponder Technologies model TTMRT-86 pulse generator replacing the pulse generator described for the pattern.

The instrument is approved with software version No 01214.

The instrument may be interfaced to the protocol convertors described for the pattern and variant 1.

Note that the SW3 switch is disabled.

5. Description of Variant 4 **approved on 16/09/04**

The Transponder Technologies model T5b calculator/indicator (variant 2) for use with a pre-set facility comprised of a model 085686-1 T5 pre-set keypad and model 085678-1 T5 keypad electronic circuitry (Figure 12) situated at the back of the pre-set keypad which connects to the T5 calculator/indicator.

The pre-set dollar amounts are selected using the "\$1" and "\$10" buttons of the keypad with a maximum attainable amount of \$999 dollars; by pressing the "RCL" button the pre-set amount is displayed on the LCD Litres display of the T5b calculator/indicator before, during and after the delivery is complete. The pre-set amount displayed can be cleared by pressing the "CLR" button before the delivery is initiated.

The T5b software is upgraded to version 1280 when it supports a pre-set facility.

The pre-set facility may only be fitted to, or replace existing pre-set devices on, fuel dispensers which are approved with a pre-set facility.

6. Description of Variant 5 **approved on 28/03/08**

A Transponder Technologies model T5BMR ('Bulk Meter Register') calculator/indicator (Figure 13a) which is similar to variant 3, except that it has an integral power supply and it is all housed in a stainless steel enclosure.

The model T5BMR calculator/indicator may be interfaced with a model T5 SMKP card (Figure 13b) to have additional facilities for self serve applications, facilities such as:

- Magnetic swipe card;
- Magnetic button reader;
- 4 × 20 character LCD display; and
- 4 × 3 matrix keypad.

The protocol convectors as described in variant 1 are situated inside the T5BMR enclosure.

7. Description of Variant 6 **approved on 28/03/08**

A Transponder Technologies model T5CIM customer interface module (Figure 13c) which has the same components/facilities described in variant 5 for the model T5BMR calculator/indicator, however the components are housed within an approved Transponder Technologies 805 series fuel dispenser to facilitate self serve applications.

8. Description of Variant 7 **approved on 7/10/08**

The Transponder Technologies model T5 calculator/indicator now for use in fuel dispensers approved for use with LPG.

For use with LPG, the conversion for temperature function is performed by the calculator/indicator in conjunction with the LPG Measurement Technology model DSSG-2000 LPG monitoring device. The device comprises a probe located in the vapour eliminator interfaced to a Transponder Technologies probe interface card located inside the calculator/indicator. The probe senses LPG density, measures the temperature of LPG, and detects if any vapour is present.

The LPG monitoring device incorporates the ASTM-IP-API Petroleum measurement Tables for light hydrocarbon, metric edition, Table 54 and Table 53 for volume conversion within the approval field of operation.

The calculator/indicator is fitted with a Transponder Technologies model 085547-2 T5 TP+LPGMDP IFC probe interface card and now uses software version TRA having build number 13** (#) to perform volume conversion for temperature and density.

- (#) The last two digits of the software version number (TRA13**) may be any number greater than '47' (e.g. TRA1348) – these last two digits represent features which are not metrologically significant.

8.1 Test Procedure – Variant 7

For testing purposes the calculator/indicator can be set to 'LPG Calibration Mode' by pressing the parameter switch (SW1) continuously until "CFg P" is displayed on the price (dollars) display and "P XXX" is displayed on the volume (litres) display.

The parameter switch should then be pressed until it toggles to the first (right hand) digit, and then pressed until the first digit changes to '1'.

The instrument is now in 'LPG Calibration Mode' and the price display will now show non-converted volume, the volume display will show converted volume, and the unit price (price per litre) display will show the temperature.

8.2 Checking Facilities – Variant 7

The following error messages may be displayed on the volume (litres) display:

- 'dEn' is displayed if the LPG density is out of range; and
- 'tEP' is displayed if the LPG temperature is out of range.

9. Description of Variant 8

approved on 28/03/08

A Transponder Technologies model T5MBMR ('Modular Bulk Meter Register') calculator/indicator which is similar to variant 5 (model T5BMR), except that the calculator and the indicator components are now housed in separate enclosures.

The model T5MBMR calculator/indicator may be interfaced with a model T5 SMKP card to have additional facilities for self serve applications, facilities such as:

- Magnetic swipe card;
- Magnetic button reader;
- 4 × 20 character LCD display; and
- 4 × 3 matrix keypad.

The protocol convertors as described in variant 1 are situated inside one of the T5MBMR enclosures.

10. Description of Variant 9

approved on 22/12/15

For use with a Transponder Technologies model TT500 calculator/indicator which is an optimised variation of the T5 calculator/indicator and for use with NMI-approve flowmetering systems.

It combines the following three core T5 components into a combined single printed circuit board construction:

- MaT5b processor;
- T5 power supply unit; and
- T5 NZPP FCN interface.

TEST PROCEDURE No S414

Instruments shall be tested in conjunction with any tests specified in the approval documentation for the instruments to which the pattern is connected, as appropriate, and in accordance with any relevant tests specified in the National Instrument Test Procedures.

The instrument shall not be adjusted to anything other than as close as practical to zero error, even when these values are within the maximum permissible errors.

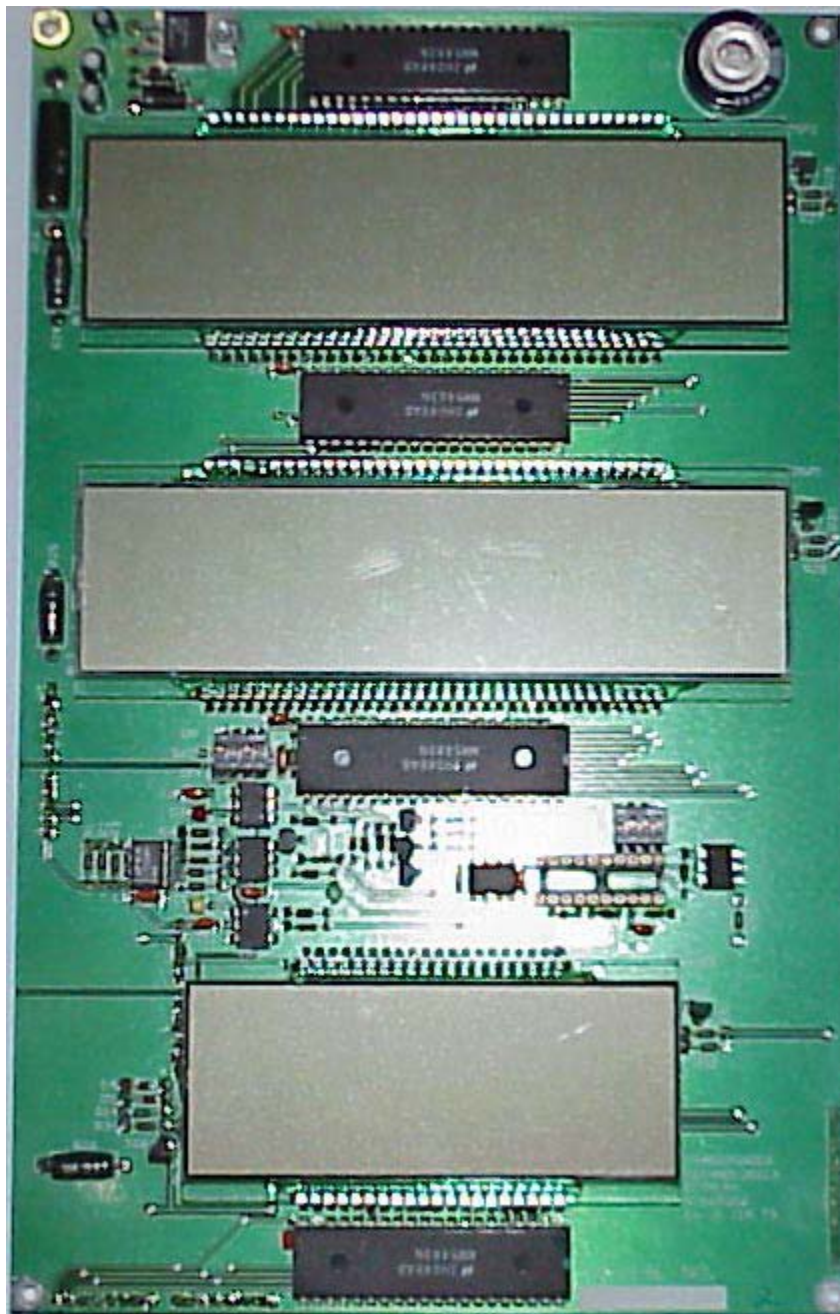
Maximum Permissible Errors

The maximum permissible errors are specified in Schedule 1 of the *National Trade Measurement Regulations 2009*.

Tests

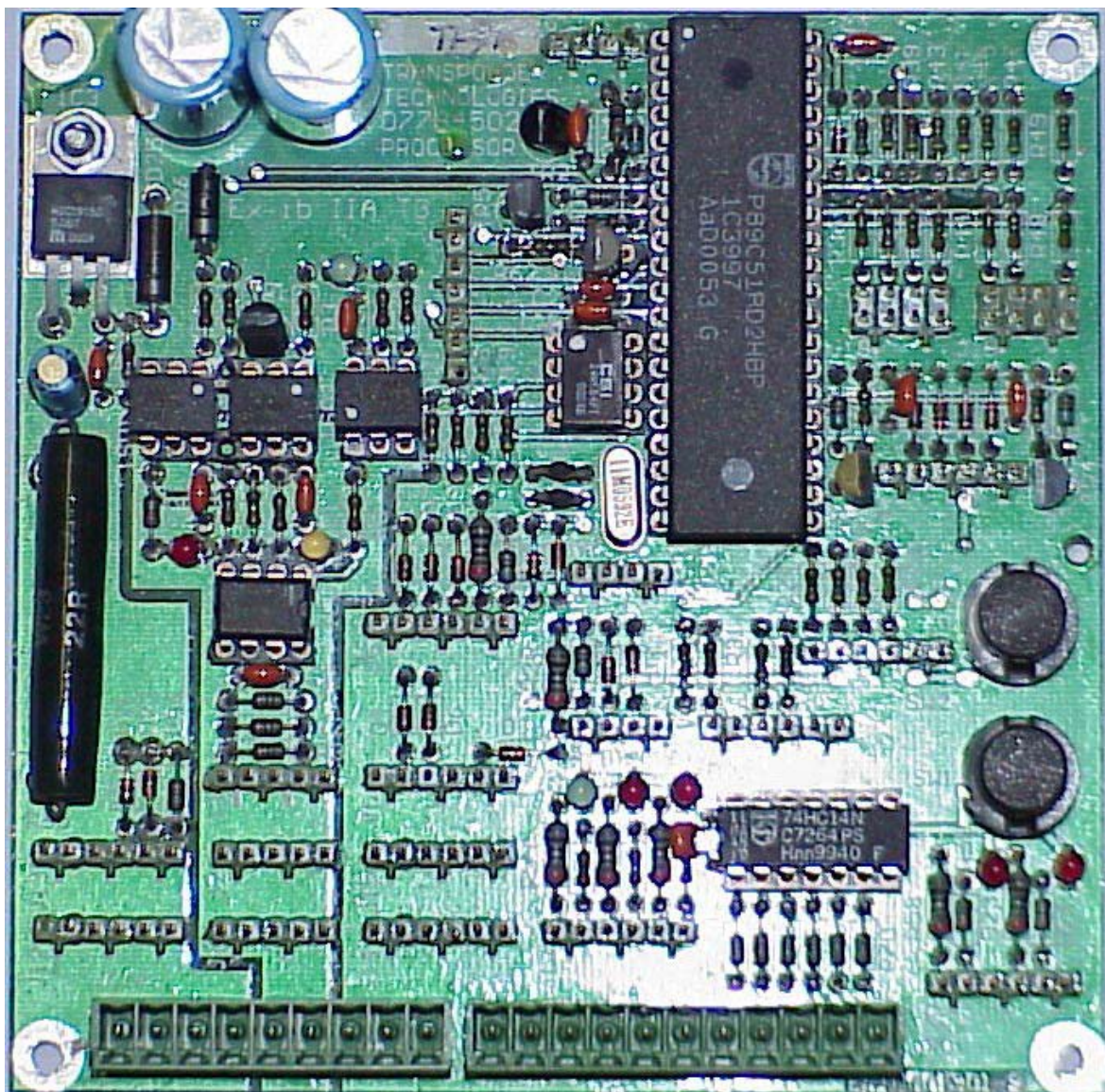
The software version number can be viewed using the push-button marked SW1 to display 'codE' in the price display and the volume display shows the version number.

FIGURE S414 – 1



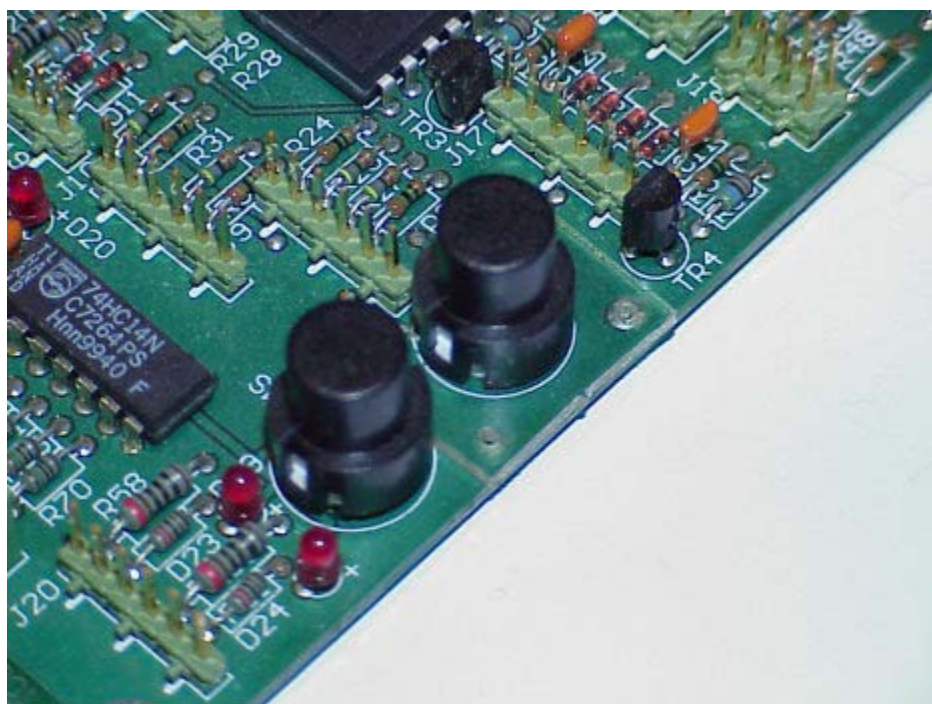
Transponder Technologies Model T5 Calculator/Indicator Display Board – The Pattern

FIGURE S414 – 2



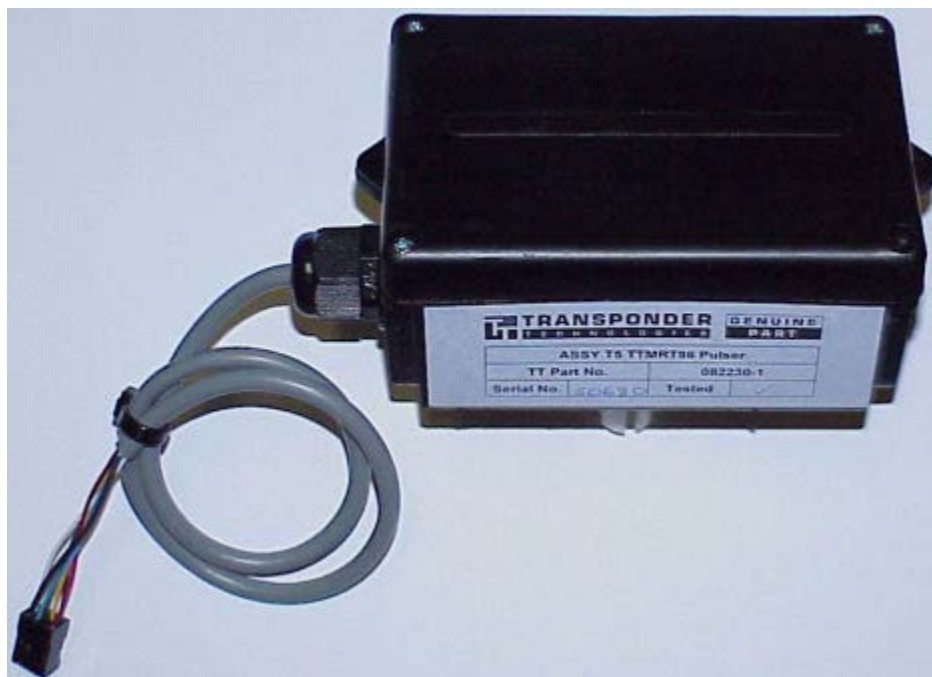
Transponder Technologies Model T5 Calculator/Indicator Processor Board

FIGURE S414 – 3



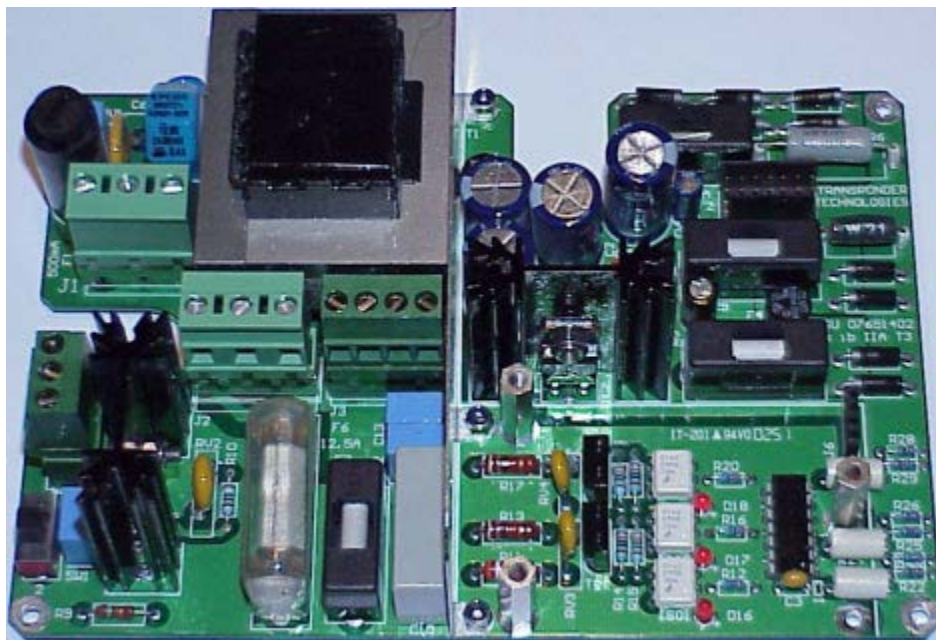
Configuration Switches – SW2 to be Sealed (pattern)

FIGURE S414 – 4



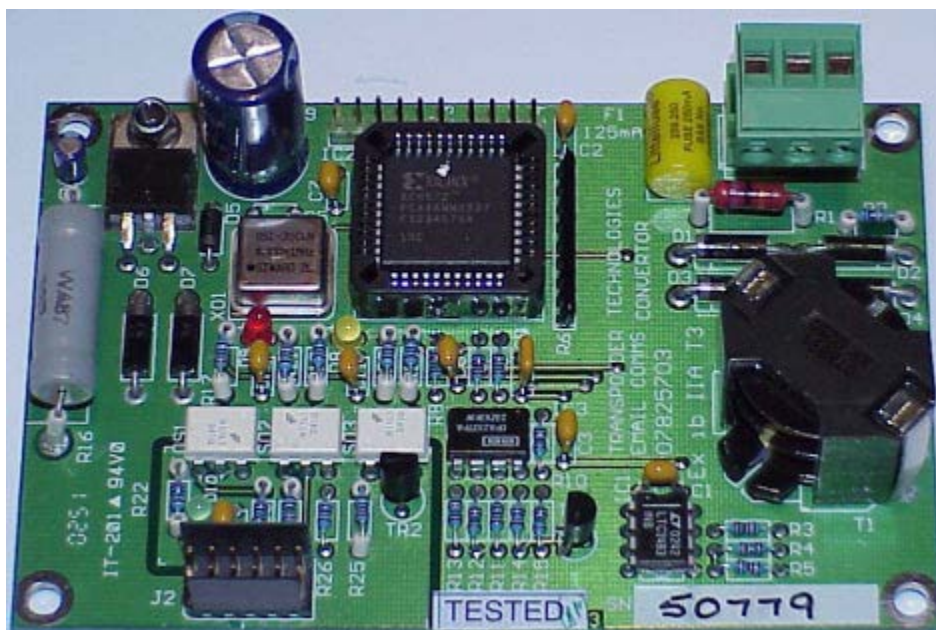
Transponder Technologies Model 082230 Pulse Generator (pattern)

FIGURE S414 – 5



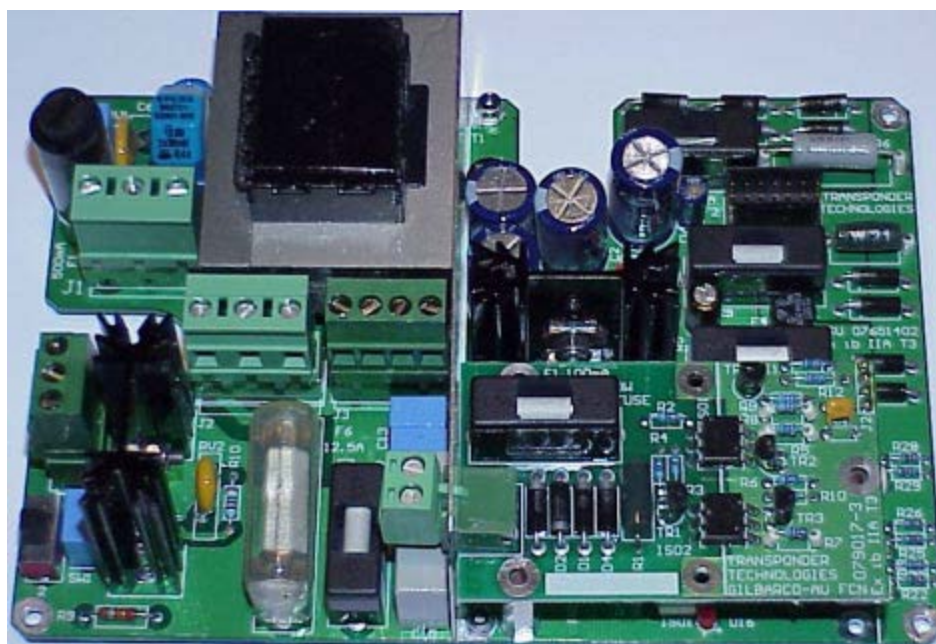
Transponder Technologies Model T5 Calculator/Indicator Power Supply Unit
(pattern)

FIGURE S414 – 6



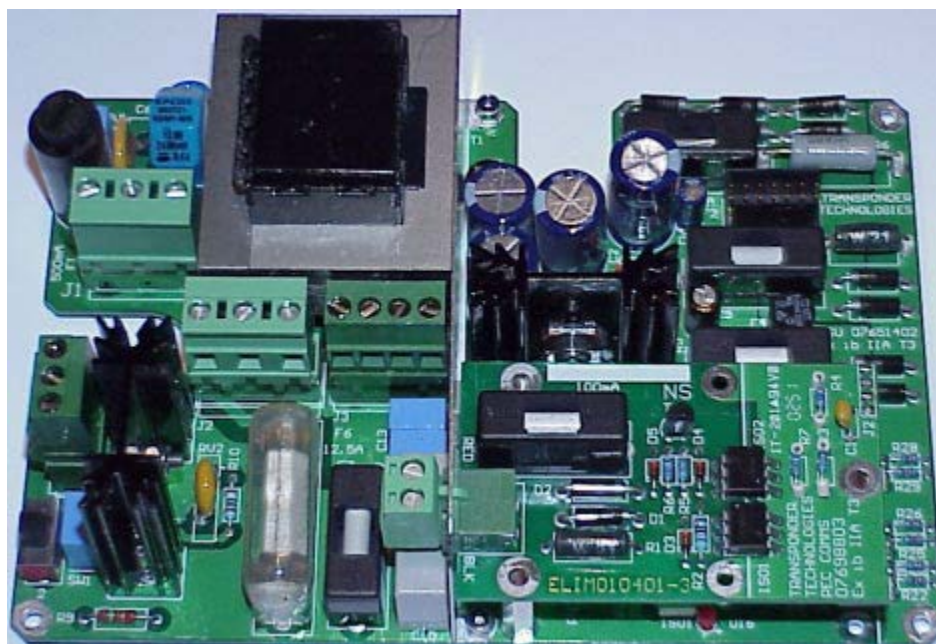
Transponder Technologies Email Protocol Convertor (variant 1)

FIGURE S414 – 7



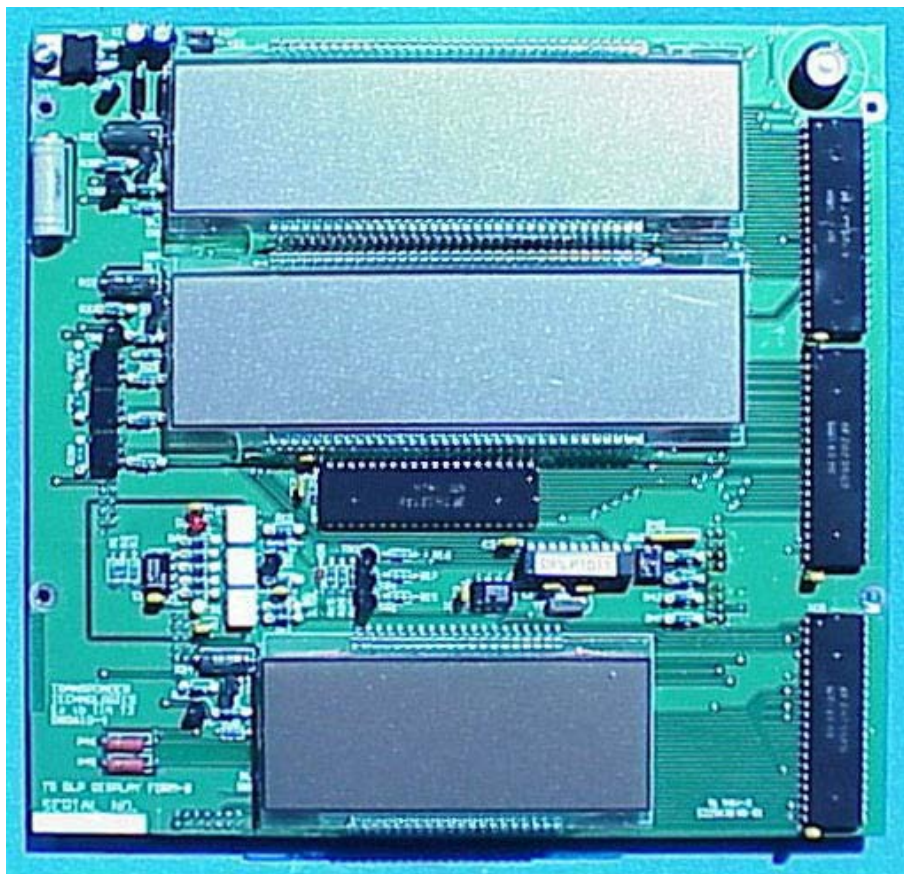
Transponder Technologies Model T5 Calculator/Indicator Power Supply Unit
With Gilbarco Protocol Convertor (variant 1)

FIGURE S414 – 8



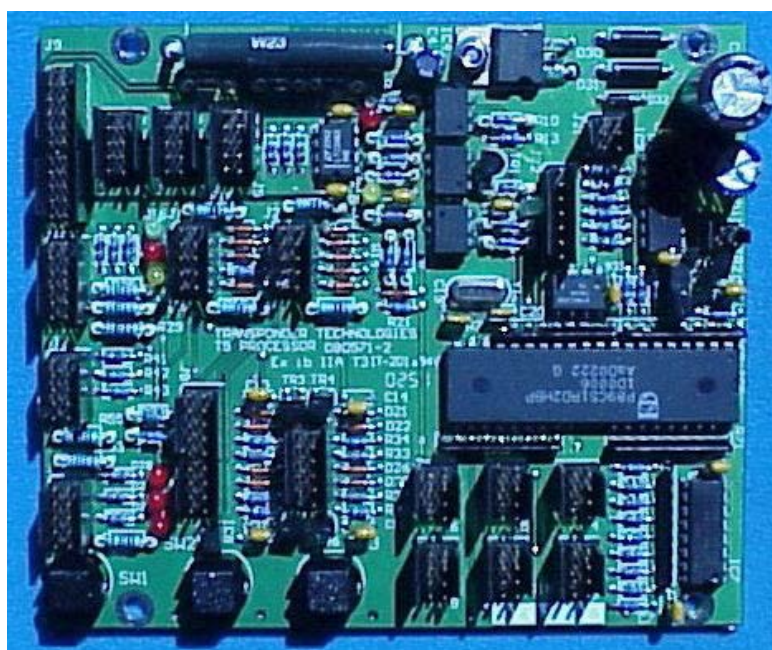
Transponder Technologies Model T5 Calculator/Indicator Power Supply Unit
With New Zealand Protocol Convertor (variant 1)

FIGURE S414 – 9



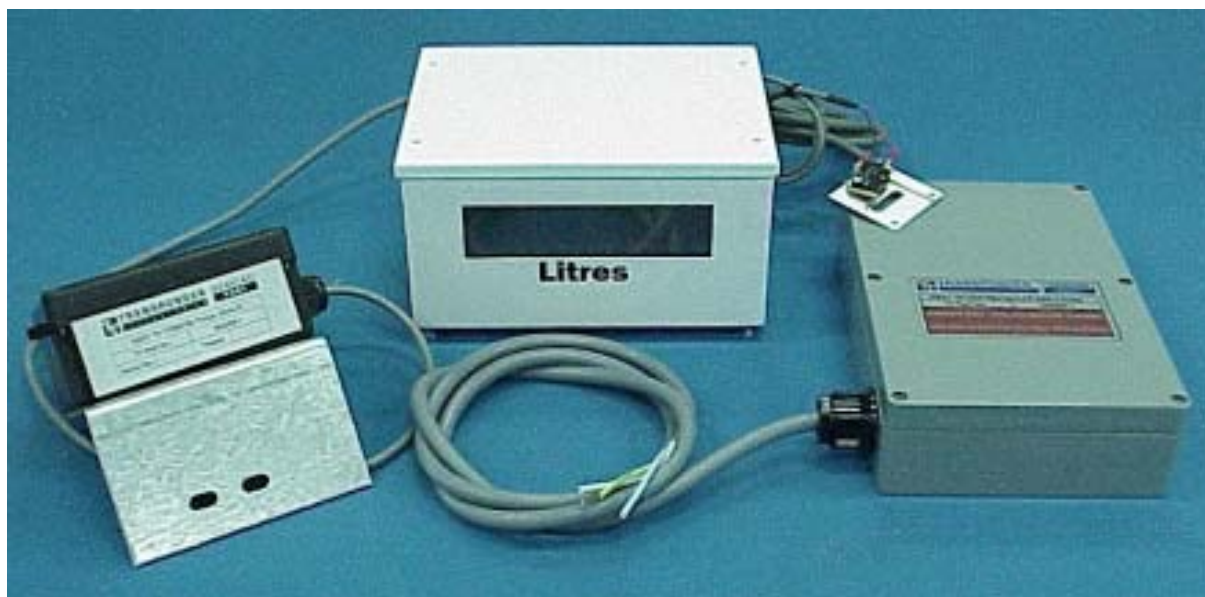
Transponder Technologies Model T5b Calculator/Indicator – Displays (variant 2)

FIGURE S414 – 10



Transponder Technologies Model T5b Calculator/Indicator – Processor Board
(variant 2)

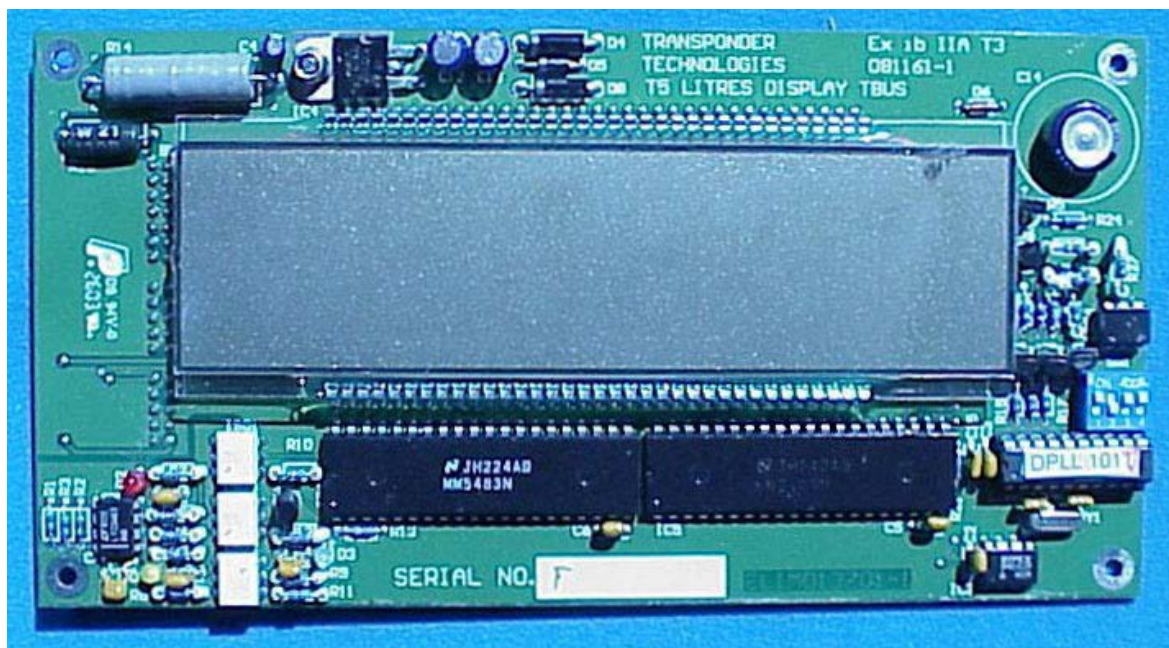
FIGURE S414 – 11



PULSE GENERATOR

DISPLAY

PROCESSOR & POWER
SUPPLY



Transponder Technologies Model T5-FLR Calculator/Indicator (variant 3)

FIGURE S414 – 12



Transponder Technologies Pre-set Keypad and Electronic Circuitry (variant 4)

FIGURE S414 – 13



(a) A Model T5BMR ('Bulk Meter Register') Calculator/Indicator



(b) A Model T5 SMKP Card



(c) A Model T5CIM Customer Interface Module

Showing Components of Variants 5 and 6