**National
Measurement
Office**

SUPPLEMENT TO CERTIFICATE

Series S015 Revision 4

Certification No.	Supplement No
1828/40*	50
1940	82
2017	84
2162/92*	99
2461/26*	30
2650/35*	75
2780	30

(*) Refers to the dispenser only, the self service or other devices described in these certificates do not form part of this approval.

Submitted by: **Multiple Card Systems A/S (MCS)**
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Authorisation is hereby given by the Secretary of State for Business, Innovation and Skills for the following Certificate of approval relating to a pattern of a liquid flowmeter to be modified as described below.

As described in the following certificates but modified to have an alternative self service device, as detailed in the descriptive annex, and having the following characteristics:-

DISPENSER: *Dispensers described in above certificate numbers*

SITE CONTROLLER: *Team Overgaard 'System 3 (Modular)' outdoor card payment terminal and site controller as described in the descriptive annex.*

This Revision replaces previous versions of this certificate

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for   Chief Executive
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(1828, 1940, 2017,
2162, 2461, 2650
2780)

CONTENTS

1   INTRODUCTION

2   CONSTRUCTION

3   OPERATION

4   AUTHORISED ALTERNATIVES

5   RECOMMENDED TESTS

6   HISTORY

ILLUSTRATIONS

Descriptive Annex

1   INTRODUCTION

Having the dispenser as described in the Certificate but having connected the Team Overgaard 'System3 (Modular)' card terminal as described herein. The 'System3 (Modular)' card terminal shall be referred to as the 'terminal' for the remainder of this descriptive annex.

The terminal is primarily intended for use in registered customer environments. It is a 'stand alone' device performing the functions of card terminal, dispenser control, and data storage. Each terminal can control up to four single or multiple grade dispensers and may be configured for computing or for volume only display.

For the purposes of this certification, the terminal is only approved for registered users.

2   CONSTRUCTION

2.1   General

The structure consists of a cylindrical terminal-head assembly mounted on a tall rectangular pedestal (see Figure 1 for general view). Construction is of steel, with paint finish. The user controls are situated within a flat recessed section within the head assembly. Illumination for the user controls is provided by fluorescent lamp source mounted within the cylindrical section above the user controls. A manufacturers label bearing serial number and model number is situated on the rear of the unit.

Principle dimensions: height 1.8 m, width 0.4 m, depth 0.5 m.

The base of the pedestal is flanged and drilled at each corner allowing the terminal to be bolted down. The terminal is typically positioned on a fuelling island, adjacent to the dispensers it controls.

An access panel for installation and maintenance purposes is provided on one side of the pedestal, near ground level. This panel is secured with a key operated latch to ensure authorised access only. The same key permits access to the main user control panel assembly, the receipt printer, and the audit roll printer (log printer).

2.2   Main assemblies

Main assemblies are as follows for the System3:

   (i)   User panel assembly   (System3M head unit, assembly No. 80015576)
   (ii)   Receipt printer5000T, assembly No. 80012013
   (iii)   Log printer   Epson TM210A, ref. 05013015
   (iv)   Modem   Lasat Safire 336 opasia, ref. 05013520
   (v)   Interface PCB Assy.   MUX (Multiplexer)
   (vi)   Pump Controller   IF-2

(1828, 1940, 2017,
 2162, 2461, 2650
2780)

2.2.1   User panel assembly   (System3M head unit, assembly No. 80015576).

This assembly for the System 3M (see Figure 6) forms the main user interface and contains a keypad for data entry and dispenser selection, a liquid crystal display for user prompts, and a card reader.   Internally it houses the major electronic assemblies.   Typical unit assembly comprises:

(i)	PCM-9375	embedded PC board
(ii)	PSPC-105	power supply unit
(iii)	PC104S / L	comms. and interface board
(iv)	DKPAR / AKT	control boards
(v)	Card reader	St. Down

2.2.2   Receipt printer 5000T, assembly No. 80012013.

This is a special-to-type printer assembly utilising a commercial thermal printer module. The unit is situated in the user access area, just below the main user panel assembly described above. The receipt printer is secured by a key operated latch located in the rear of the head assembly and may be accessed for maintenance, or for routine activities such as printer roll replacement. A view showing the receipt (and journal log) printer partially withdrawn from the main assembly is shown in Figure 4. A typical receipt is shown is Figure 5.

2.2.3   Log printer (Epson TM210A), ref. 05013015.

The printer is a standard commercial unit, mounted within a drawer situated beside the Receipt Printer described above. The drawer may be released by a further key operated latch, also located in the rear of the head assembly. Releasing this latch allows the drawer assembly to be partially withdrawn, enabling access to the log printer for maintenance, or for routine activities such as printer roll replacement and printer audit roll collection. A view showing the log printer drawer partially withdrawn from the main assembly is shown in Figure 4. A typical journal extract is shown in Figure 5.

2.2.4   Modem (Lasat Safire 336 opasia, ref. 05013520) - commercial unit

2.3   **Electrical**

Mains power is terminated in the lower section of the pedestal (and may be accessed via the panel). Input supply (240 V, single phase) is brought to the DIN terminal block where filtering and distribution are accomplished.

Fused and switched outlet sockets are provided for mains powered equipment such as the journal printer power supply unit. A mains supply connection is fed to the main user panel assembly and is then routed to the power supply unit (PSU) type PSPC-105. The PSU provides the dc supplies for the electronic circuits.

This location also houses the lighting control gear for the terminal illumination lamp and the 'MUX' (multiplexer) interface board.

(1828, 1940, 2017,
 2162, 2461, 2650
2780)
Electronics

The principal printed circuit boards used in the terminal are detailed below. A block diagram of the electrical and electronic arrangement is shown in Figure 3.

2.3.1   Main computer board PCM-9375, for System 3

The embedded PC board is housed within the user panel assembly and has the following characteristics:

        Microprocessor: Geode GX-MMX running at 500MHz
        RAM: 512 MByte
        Harddisk   :   40 GByte

The operating system is Windows XPe © (embedded Windows XP).

The main board provides four RS-232 channels. One is configurable as either 485 or 232.

2.3.2   Interface boards PC104S / PC104L, for System 3

These two interface boards provide four RS-232 channels and one LON network channel. They are housed within the user panel assembly. Their main function is interfacing with external devices as detailed below:

-          4 serial channels for RS-232 communication to host systems and journal printer as well as for communication with various internal and external peripherals.

-          IFSF dispenser interfaces as described in Section 2.5.

2.3.3   Power supply unit (PSU) type PSPC-105, for System 3

The 'PSU' board is housed within the user panel assembly. Its main function is the provision of dc power supplies for the remainder of the equipment. The PSU incorporate limited battery back-up which permits controlled shut down in the event of mains power failure.

2.3.4   MUX

The MUX (Multiplexer) is mounted within the pedestal section of the terminal. Access is via the maintenance and installation panel. The MUX interfaces between up to four attached electronic dispensers (as detailed within Section 2.5 below) and the main user panel assembly.

(1828, 1940, 2017,
 2162, 2461, 2650
2780)

Dispenser interface arrangements and protocols

2.3.5   The terminal may be configured (by means of hard-wire links) to interface with a wide range of specified dispenser types.

2.3.6   Provision is made for interfacing by means of IF SF (LON) or by use of standardised external two wire current loop to the dispenser manufacturer's defined protocol and level. IF SF connection is performed in the 'concard' board, which is housed within the User Panel Assembly. Two wire current loop interfacing is connected at the 'MUX' board. In all cases, the boards contain devices to maintain electrical isolation between the terminal and the dispensers

2.3.7   For the equipment described within this certificate, the connected dispenser type is 'Pumptronics' with connection via current loop interface using Pumptronics two-wire protocol.

3   **OPERATION**

3.1   **System operation**

3.1.1   System operation is centred on an embedded microprocessor board and is largely configurable. Configuration settings and functional and transaction data storage are all stored on solid state flash memory devices, or on a hard disk. The assignment of the flash memory is also configurable in accordance with site requirements.

3.1.2   The terminal can perform card validation, pin code verification and authorise fuel deliveries on attached fuel dispensers. A communications interface provides full capabilities to upload transaction batches for central processing as well as the capability of accepting black lists or white-lists for off-line card validation. Optionally the software may support on-line validation of cards. If the transaction memory fills, the terminal is automatically taken out of use.

3.1.3   Advanced set-up and management functions may be activated directly at the terminal (code access) or remotely through the communication link.

3.2   **Controls and features**

3.2.1   User terminal (Figure 2)

A dispenser may be authorised by the use of a valid magnetic strip card. The terminal has the following controls and features:

- A card reader. This is located on the front face of the terminal. This enables the insertion, reading and return of the card.
- 96-character (4 lines by 24 characters) graphic backlit LCD display. This provides prompts and confirms data entry. Optionally a 48-character (2 lines by 24 characters) character LCD display is used.
- An alphanumeric keypad.
- Receipt issue cage.

(1828, 1940, 2017,
2162, 2461, 2650
2780)

3.2.2   Unit price change

The dispenser unit price may be changed by one of the following actions:

(i)   A new unit price has been sent from a back-office controlling system (such as a Turbo Tank) via the TO-I serial communication protocol.

(ii)   A new unit price has been entered using the Terminal keyboard and its menu system after a valid management card has been inserted.

A unit price change in the Terminal is set on the dispensers only after completion of current transactions and re-holstering of nozzles.

3.2.3   Dispenser

Communication between dispenser and terminal is maintained via the serial interface. This enables the terminal to monitor nozzle status. Once a transaction is authorised, the terminal controls the dispenser via the nozzle switch. The terminal presents an ongoing display of volume during delivery.

3.3   **Sequence of operation**

The table below (Table 1) shows a typical sequence operation for a card transaction. There are other sequences possible that follow this basic form. These are configurable and are dependent on card type or set-up of terminal.

Table 1 - SEQUENCE OF OPERATION (Typical card sequence)

Action by purchaser	Display at terminal	Printer	dispenser
Approaches terminal	'Insert card'		
Inserts card	Card is read and returned		
Takes card	Vehicle No:		
Enter data, or select next option	Odo:		
Enter data, or select next option	Choose dispenser (1, 2, 3, or 4)		
Select	Please wait ... followed by 'Ready to tank'		Dispenser is authorised
Dispense fuel	Display may show volume information during filling		Fuel dispensed
Replace nozzle	Display returns to initial	Journal printer records transaction	
Press 'print' to obtain receipt	'Insert card'		
Inserts card		Receipt printer prints receipt	
Collects receipt	-	-	-

(1828, 1940, 2017,
2162, 2461, 2650
2780)

3.4 **Legends**

Various legends are displayed depending on the terminal use and configuration.

3.4.1 During normal operation the following operating messages appear during fuelling:

- Insert card
- Card control
- Vehicle No: (depending on terminal set-up and inserted card)
- Odo: (depending on terminal set-up and inserted card)
- Driver No: (depending on terminal set-up and inserted card)
- Choose dispenser   (1, 2, 3, 4)
- Please wait
- Ready to tank 1 (or 2, 3 or 4 depending on selection)

During delivery the terminal may, depending on its set-up, show the volume being dispensed to the customer in the display, in the form shown below:

> 1: 23.87   2: 43.01

Depending on the set-up of the terminal, receipt may be requested by reinserting the card after a fuelling has taken place or requested by pressing the Print button on the keyboard. If the receipts are requested by re-insertion of the card, the following message will be shown:

> Receipt....
> Please take receipt

If receipts are requested by pressing the Print button, the following message will be shown:

> Insert card

Whereafter, the terminal prints the receipt.

3.4.2 Under the following abnormal operating condition, legends are as detailed below:

If the receipt printer is 'off,' faulty, 'paper low', or 'paper out', display shows:
- Insert card
- Receipt not available
- 'date' 'time'

3.4.3 **Interlocks and security features**

3.4.3.1 In the event of power failure, battery back-up permits controlled shutdown and maintenance of the real time clock. These actions are controlled directly on the main processor board with any current transaction information retained until the power is re-applied. Data retained in flash memory is non-volatile and will remain virtually indefinitely.

(1828, 1940, 2017,
2162, 2461, 2650
2780)

3.4.3.2 Terminal operation ceases immediately upon loss of power and can only be regained when power is restored. At this time a transaction is generated in order to register volume delivered. Part completed transactions are stored and reinsertion of card when power has been restored will generate the appropriate receipt. Receipts for transactions completed prior to loss of power can be obtained subsequent to restoration of power by reinserting the card.

3.4.3.3 Transactions are only permitted if the presented card is valid, the user instructions are followed correctly and the dispenser selected is not already in use. The dispenser will not dispense fuel until it is correctly registered by the Terminal.

3.4.3.4 The following time-outs are in use (see also Table 2 below):

- Max runtime: This is the total time a dispenser may be selected by the user. If this timer runs out, the dispenser motor is stopped.

- No pulse time: This timer starts when the nozzle is taken. If no pulses are registered within this time, the transaction will be terminated. This timer is reset whenever pulses are registered during a transaction.

- No fuel time: This timer determines the maximum time from when the user has selected the dispenser at the terminal until the nozzle is taken. If this timer runs out, the transaction is terminated.

Additionally, there is a Max null-transactions set-up that prevents the dispenser from being selected if it continually times out with zero transactions (which could indicate a faulty pulser unit).

The Max error pulse set-up determines the maximum number of error pulses (given that a double-channel pulser is in use) in any transaction. This is to prevent the dispenser from being used if a faulty pulser is in place.

Table 2 - TIME-OUTS

Item	Type description	Range	Transaction effect
1	Dispenser released but nozzle not taken	1 - 255 seconds	Transaction is terminated as a zero-volume transaction and dispenser is deselected
2	Dispenser released, nozzle taken, but no fuel dispensed	1 - 255 seconds	Transaction is terminated as a zero-volume transaction and dispenser is deselected
3	Transaction time-out (Max run-time)	1 - 65535 seconds	Transaction is stopped. Journal records the reason for stopping the transaction
4	User does not enter required information before filling	30 seconds	Terminal reverts to the idle state

9

(1828, 1940, 2017,
2162, 2461, 2650
2780)

3.5   **Software issue**

The software issue (which is displayed on screen briefly after switch-on) is PB 2.52 D433

3.6   **Software security**

3.6.1   Access to software controls is restricted to authorised holders of a service card and a valid code. At this level the basic parameters such as DATE and TIME settings can be made. To access the advanced level containing parameters that are used for the setting of site configurations etc., a 'mastercode' is specified that changes on a daily basis and is only made known only to appropriately authorised personnel.

3.6.2   Transaction security

3.6.2.1   Transactions are stored in Flash memory that has virtually indefinite data retention period.

3.6.2.2   For enhanced data security, each transaction data batch is held in two separate sectors within the memory.

3.6.2.3   For external communications ports, transactions are protected from deletion by software algorithms that require confirmation by host system and terminal that data batches have been correctly and fully delivered to the host prior to reassignment of terminal memory.

3.6.2.4   Provision is made such that transactions underway during a power cut will be completed when power is re-applied; thus ensuring that no volume data is lost.

3.6.3   Card payment security

Standard payment security protocols are employed for all current card issues. Additionally, sectors of the flash memory can be assigned to provide 'whitelist' or 'blacklist' data for on-site verification depending on operational requirements. Uploading or downloading of this data utilises software algorithms described above to prevent unauthorised deletion. Typical allocations of flash memory between 'transactions' and 'blacklist/whitelist' requirements are as follows:

Black-listed cards	Transactions
15,000	7,000
32,000	3,500
42,000	1,500

(1828, 1940, 2017,
2162, 2461, 2650
2780)

4   AUTHORISED ALTERNATIVES

4.1   Journal printer - any CE marked serial printer.

4.2   Modem/PC link, or ISDN connection

Any CE marked equipment of the following types, may be powered and mounted within the terminal to achieve connection between the Terminal and remote sites.

- PC link
- ISDN
- X.25
- V .34 modem
- TCP/IP (for the 3M model)

4.3   3S Terminal (Figure 6)

As described in the descriptive annex but having an alternative display in a different housing.

4.4   Hydra3S Terminal (Figure 7)

As described in the certificate but as amendment of 3S model with integrated HTEC SiriusCRIND 2 module.

5   RECOMMENDED TESTS

**5.1   The following tests may be carried out in addition to those specified in the Regulations to determine conformity to the approved pattern.

**5.2   At initial switch-on of the terminal, note that initial display is as described in section 3.5.

**5.3   Verify, where practicable, that the operation of the interlocks and security features is as described in Section 3.4.3.

**5.4   Check where deliveries have been authorised by the terminal and no fuel dispensed, that a receipt indicating a zero transaction is issued.

(1828, 1940, 2017,
 2162, 2461, 2650
2780)

6 CERTIFICATE HISTORY

ISSUE NO.	DATE	DESCRIPTION
Series S015	17 October 2007	Certificate first issued as a supplement.
Series S015 Revision 1	4 August 2010	Section 4.3 - alternative 3S Terminal
Series S015 Revision 2	28 April 2011	Front Page – Additional Fuel Dispenser 2650 Supplement 75 added. Application by: Gilbarco Veeder-Root Crompton Close Basildon Essex, SS14 3BA United Kingdom
Series S015 Revision 3	26 November 2012	Front page: Dispenser 2780 supplement 30 added. Application by Petrotec, Inovação e Industria S.A
Series S015 Revision 4	31 January 2013	Front Page, Submitted by address changed from Erantisvej 40 to Valnaesvej 1 Section 4.4 – Alternative Hydra3S Terminal added

(1828, 1940, 2017,
 2162, 2461, 2650
2780)

Figure 1   General view of 'System 3 (Modular)'

Figure 2   Terminal panel

FRONT PANEL

System3M head unit USER PANEL ASSEMBLY

| Card Reader | Display | Keyboard | | Receipt Printer | Journal (log) Printer |

| PC104S / PC104L | PSPC-105 P.S.U. | PCM-9375 M.P.U. |

8

Up to 8
device interface
ports, including
: Journal printer
: Modem
: Ethernet
: + unassigned

MUX

Power Inlet
and
Distribution

IF SF   2 wire
current loop

Dispensers

240 V ac
Single φ
Supply

240 V Mains

low power
and signal
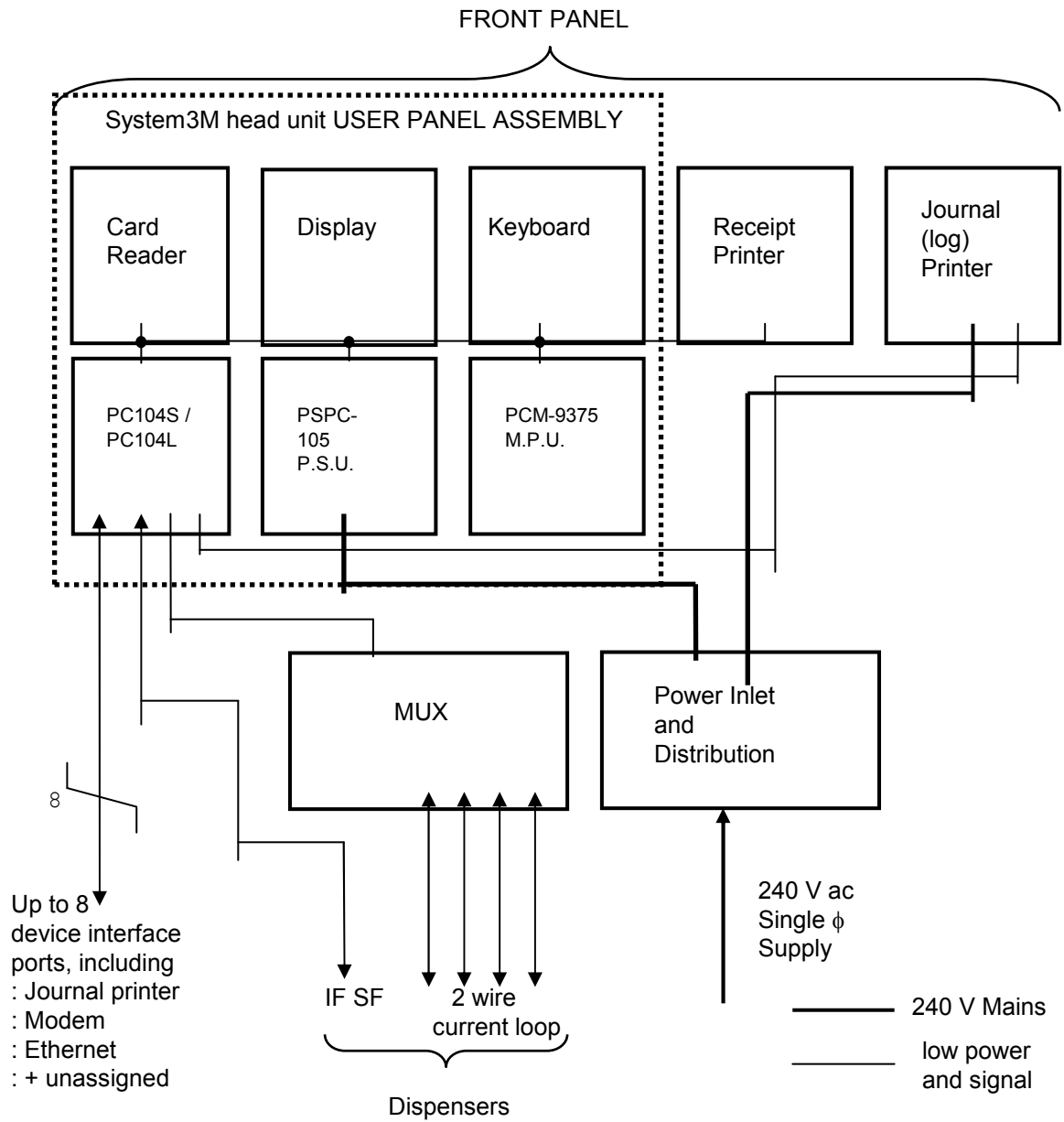
Figure 3   Functional block diagram of 'System 3 (modular) terminal

14

Figure 4 Views showing printer access
LH view: receipt printer   RH view: journal log printer

User receipt

Sample journal log

Figure 5 Typical print-outs

Figure 6 3S Terminal

Figure 7 Hydra3S Terminal