F240A & B

Multimedia validators

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Product Description

- **Combo validators for contactless smart cards, paper tickets and contact smart cards**
- **Entry level, paper tickets F240/P can be upgraded to F240A**
- **Highly configurable, rich set of fittings and options**
- **Rugged RWS version for railway stations**
- **High performances thanks to embedded architecture**

F240, the flexible family

F240 is a family of validators composed by F240/P, F240A and F240B series.

- F240/P is a plain paper validator that can replace any traditional electromechanical obliterator but that can be upgraded to become F240A intelligent, electronic validator, even at a later time;
- F240A is an intelligent, electronic validator offering great flexibility and configurability;
- F240B is similar to F240A with the differences stated in this document.

Generally speaking:

- choose F240/P for obliterator replacement and then upgrade it to F240A when you subsequently need an electronic validator;
- choose F240B base model when you want at once a paper tickets and contactless validator. F240B has furthermore graphic display, suitable also for non Latin alphabets, but cannot accept old contact smart card.

All F240 validators can be ordered for 3 different legacy mounting supports; F240/P can moreover be equipped with emulating software for most common old style validators. Other minor differences among models are described in this document.

F240 validators fully integrate with any other AEP on board device and with ET - The Easy Ticketing, AEP automatic fare collection system. Like any other AEP product, F240 are open. AEP can supply interface and development kits (except for F240/P), as well as support, for writing customized applications and integrating with third party systems.

Note: "/P" indicates the presence of paper ticket validation unit (see below "Ordering information"). F240A is an upgraded F240/P, so it always has paper ticket validation unit (F240A/P). F240B could in theory be ordered also without "/P" fitting but in this case other AEP products, like Futura 3A, are a better choice.

Body

F240 body is made in injection moulded ABS, with self-extinguishing class UL94 5VA (the best one); color is embedded into material for longer duration.

The unit is closed by a key lock that has furthermore the purpose of locking the device to its support (see below). It's possible:

- to dismount the validator from the support without opening the box;
- to open the box without dismounting the validator from the support.

Standard colors: yellow RAL 1023 for the front part, black RAL 9017 for the back. Different colors are available upon request.

Internal accessibility: front cover can be removed without dismounting the validator from its support. Removed the front cover, all the machine parts are immediately accessible for maintenance operations like, for example, printer ribbon replacement, foreign bodies removal or for other maintenance operations.

Housing protection: IP40 (IEC EN 60529), when installed on its supports. It's possible to use a shower cap to allow jet washing.

Vandalism protection: IK07 (IEC EN 62262), when installed on its supports.

Dimensions: 300x188x150 mm (packed 400x300x250).

Weight: 2,900 g (packed +1,100 g).

Shock and vibrations resistance: according to IEC EN 50155.

Packaging: designed for protection against accidental bumps during transport. Packing material comply with 94/62/CE directive.

User interfaces

Display: visible in almost any light condition and protected by a polycarbonate plate, with V0 flammability grade.

- F240 and F240A: backlit alphanumeric LCD display, with 2 rows of 16 character 8 mm each; visible area 99x24 mm.
- F240B: backlit graphic display, 128x64 pixel. Support for non Latin alphabets as Hebrew, Arabic, Greek, Cyrillic etc. Visible area 70x40 mm.

User keyboard: 4-key user keyboard to select the fare or to perform other operations requested by the application software. It is possible to order the unit without the keyboard.

Internal keyboard: 5-key for parameters setup.

Lights:

- F240 and F240A: 3 x 10x20 mm LEDs, red, green and orange.
- F240B: 4 x 10x20 mm LEDs, red, green and orange1 and orange2.

Beeper: sound level 56 dBA @ 50 cm (F240/P) **manca F240B**.

Mounting

Unit is placed on the bus by mean of fast mounting supports, to which it is insured through a customizable key lock. No tools are required to mount and dismount the unit. Electrical connection is contextual with insertion (no manual connector insertion is required). Cables are protected and not accessible from outside.

All F240s can be supplied with 3 different types of mounting system:

- PSA, industry standard mounting system for electronic validators

All F240 models can be obtained with PSA (industry standard), PSC (legacy) or PSL (vintage) mounting system.

(/PSA fitting). Exclusive, anti -vibrations, AEP "Spring-O-Lock" male pins on validator side;
- PSC, industry standard mounting system for legacy obliterators (/PSC fitting, male pins on support side);
- PSL, industry standard mounting system for previous generation obliterators (/PSL fitting, male pins on support side).

Supports: AEP offers a choice of PSA and PSC supports, in many variants for different applications.

Connector: multi pole 16 pins male connector, specially designed for automotive industry. Pin assignment can be customized according to Customer's request. Connector type:
- PSA mounting: DIN 41622
- PSC and PSL: WPI 26-159-16

Position detection: 3 digital inputs to identify validator position on the bus network. Up to 8 different positions can be encoded through a suitable wiring of the connector of support plates. Some supports are furthermore available with an EEPROM memory to store network address and/or other parameters.

Hot swap: (PSA only) unless validating tickets, F240 validators can be extracted from supports also when powered. In the same way it is possible to put them on a powered support. Any eventual reconfiguration/ updating can take place automatically. These features depends on software implementation.

Warning: not every validator model carries out on the connector all the possible signals from the electronics. Validators' wiring may vary according customer's specification.

Contactless subsystem

AEP has entirely developed in its own labs the technologies for contactless smart card processing, creating units which are capable of processing almost any type of smart card existing on the market; moreover, the internal design allows AEP to upgrade to any future requirement simply through software updates.

Thanks to the modularity of the system, all AEP devices share the same software functions related to contactless smart card process. Any specific information is reported apart below.

Contactless subsystem is included in /X fitting.

Calypso standard

AEP uses, under Innovatron Company license, the Calypso technology which is today, both in Italy and in the world, perhaps the most widely accepted standard for contactless cards in public transport area.

An AEP validator was the first in the word to successfully pass the audit for Calypso 3 registration (see www.calypsotechnology.net).

Technical specifications

Contactless sub system allows to read and write cards according ISO 14443A & B, ISO 15693, NFC (Near Field Communication), Sony FELICA etc. For example CD21, Tango, TimeCOS, GTML, CD97, CT 4002, CTS, MIFARE Classic, MIFARE Ultralight, DESfire, MIT (Maschera Italiana Trasporti) etc.
- Carrier frequency: 13,56 MHz.
- Command set: 7816 3-4.
- RF speed: up to 424 kbps (848 with selected types);
- Security features: anticollision, encrypted communication using DES and 3-DES algorithms, mutual authentication between validator and card and between card, reader and validator;
- SAM interface: for 4 ISO 7816 modules.
- Antenna type: digital (F240A); analog (F240B).

Performances

Transaction time: less than 110 ms. Test conditions: CD-21 card at 424 kbps; testing operations: Select Application / Select SAM / Open Session / Read Record / Read Record / Update Record / Close Session; in time counting are included Calypso SAM operations. More complex transactions may require more time.

Reading distance: operating range from 0 to maximum 100 mm from the antenna, depending on card model (type & manufacturer). Best performances are obtained with cards provided or approved by AEP. For other cards, the reading distance depends on the brand and the model; optimal performance may require reconfiguration and/or recalibration of the antenna circuit.

F240 was designed for maintenance. In few seconds, cover can be removed and internal frame tilted to gain access to any internal parts.

Technical specifications

F240/P

CPU: 16-bit microcontroller @ 14,7 MHz with 2K RAM and 60K FLASH

Operating system: none

Serial port: 1 x with software selectable RS-232 or RS-485 interface.

Upgraded configuration: when upgraded to F240A, F240/P is used as a slave device of SCBM2 CPU (see below) to control ticket validation printer, display, LEDs and keyboard; serial port is used internally.

F240A & F240B

Architecture: both F240A and F240B use unified SCBM2 CPU common to many AEP devices that ensures high performances, uniform and consistent architecture, easy software portability across different devices and easier maintenance.

CPU: 32-bit processor @ 50 MHz with 8M DRAM, 512K SRAM, 2M + 384K FLASH

Operating system: AEP Mxm 5.0.

Mass storage: 2G internal SD module for manual data / program transfer.

Clock/calendar: programmed for automatic change of summer time and for leap years;

Measurement: supply voltage, internal temperature and room light.

Ethernet 10/100 IEEE 802.3

Serial ports:
- 1 x with 3-wire RS-232 interface;
- 1 x with 6-wire RS-232 interface;
- 1 x with RS-485 interface.

USB: 1 x (device).

Digital I/O: 2 x unprotected outputs, NPN type, under software control. 2 x digital inputs. Odometer input (0/5÷24V).

Watchdog: auto reset in case of software/hardware locks.

Power management:
- the unit can be switched on or off by a remote electrical signal. ("activate" line)
- power off can be issued by software;
- automatic programmed switch on at defined date and time.

Battery: 3V3 internal lithium battery for RTC.

Wireless LAN module: optional WI-FI (IEEE 802.11b/g) interface (-WIFI option for F240A; /WIFI fitting for F240B).

UHF module: (F240A only) legacy 433 (-UHF433 option) or 868 MHz (-UHF868 option) AEP module, according ETSI EN 300 220. Not recommended for new applications.

Ticket validation printer

Printer: dot matrix impact. ASCII standard character set, international; condensed print software selectable. It prints on top side of the ticket. Resolution 80 dpi. Print head expected life: 70 millions characters.

Ink ribbon: Star Micronics Co. endless loop. Expected life in ideal conditions: 2 millions characters (condensed print).
- violet RC200P, manuf. code 30980021;
- black RC200B, manuf. code 30980121.

Cutter: corner cutting device is available as a /CUT special fitting. Any time the ticket is inserted, a small rectangle is cut from the right side corner. In this way, the next validation shall be printed down one line more toward the ticket's center. This technique is used to execute multiple validations on the same ticket. In F240A this fitting is not compatible with the /C fitting.

/3POS fitting: fixed offset of the validation string on the ticket, so that leave free the first two lines.

Software architecture

AEP Mxm 5.0 operating system allows high performances and optimum memory usage. Generally, it requires 10 to 20 times less memory respect Linux or Windows, with speed about 5 to 10 times higher at the same clock frequency. Very complex applications hardly reach 500 k of memory requirement. Large amounts of processor memory remain therefore available for fast table searching, e.g. for black and white lists, while SD/MMC memory modules ensure huge space for data storage. Mxm makes this product an open product; AEP encourages independent developers and supplies software developers kits (SDK) and related support.

Requirements

Temperature: storage, -20÷60°C; operating, -15÷60°C (-25° in T3 fittings available only for F240B). Test methods: dry heat IEC EN 60068-2-2 (Bd test, device on), cold IEC EN 60068-2-1 (Ad test, device off). It also conforms to IEC EN 60950-1, par. 4.2.7, "Stress relief test" (7 hours at 70°C) test.

Notes: this device is for use by human operators, therefore not in the extreme conditions of the above tests. Exposing the unit for pro-

On the right, F240B easily recognizable for graphic display. On the left, an F240 boxed in *RWS version, suited to railway stations and harsh environment.

longed periods at a temperature of 60°C may cause thermal printer reduced operation. As for any ABS unit direct UV exposure might cause color fading and alter mechanical features. In any case, solar exposure must not cause environmental conditions exceeding above limits.

Humidity: 5 to 95%, non condensing; test done from 25 to 45°C. Humid heat cycle according IEC EN 60068-2-30 test.

Power supply: +24VDC; min. 18V (21,6 in /CUT fitting), max 32V. F240B exceeds IEC EN 50155 requirements. Insulating class: III (SELV). Protected against polarity inversion. Maximum current 1,5A @ 24V. Power up transient: 3A for about 50 ms. Device must be powered by a limited power source as per IEC EN 60950-1. Pollution degree 2, according CEI EN 60950-1, 2.10.1.2.

Quality and standards

MTBF/MCBF: 50,000 hours 750,000 cycles, evaluated by mean of theoretical calculation and field data for similar devices (UNI 10147:2003).

Device is classified as "Information technology equipment" and complies with:
- Radio Equipment Directive: 99/5 CE and subsequent amendments;
- Directive 2002/95 CE "Restrictions on the use of specific Harmful Substances in the manufacture of electrical and electronic components (RoHs)"
- Electromagnetic Compatibility Directive: 89/336 CE.
- Low Voltage Directives: 2006/95 CE and its subsequent amendments;
- Automotive Directive: 2004/104/CE with upgrades related to directives 2005/49/ CE, 2005/83/CE and 2006/28/CE (homologation and "e" mark by Ministry of Transport of Italian Republic).

This device is therefore compliant with the following international standards: IEC EN 55024:1999-04; IEC EN 55024/A1:2002-07; IEC EN 55024/A2:2003-06; IEC EN 55022:1999-06; IEC EN 55022/A1:2001-10; IEC EN 55022/A2:2003-08; IEC EN 55022-A1-A2/EC:2005-12; ETSI EN 301 489-1 V1.8.1 (2008-04); ETSI EN 301-489-3 V1.4.1 (2002-08); ETSI EN 302 291-1 v1.1.1 (2005-07); ETSI EN 302 291-2 v1.1.1 (2005-07); IEC EN 60950-1:2006-04; IEC EN 50371:2004-06.

Tests were performed according the following standards, where applicable: IEC EN 61000-4-2 (IEC 210-34); IEC EN 61000-4-3 (IEC 210-39); IEC EN 61000-4-4 (IEC 210-35); IEC EN 61000-4-5 (IEC 110-30); IEC EN 61000-4-6 (IEC 210-40); IEC EN 61000-4-8 (IEC 110-15); IEC EN 61000-4-11 (IEC 110-29); IEC EN 50155 for shocks and vibrations tolerance (EN 61373); IEC EN 60529; IEC EN 60068-2-1; IEC EN 60068-2-3; IEC EN 60068-2-30.

For further information refer to document "AEP Quality System and Standards", P/N 702547.

Ordering information

	Type	F240/P(4)	F240A	F240B	Description
*RWS	VERSION	☑	☑	☑	Special iron standing box version for railway stations or anyway in harsh environment. It includes power supply, GPRS/UMTS modem and can withstand hot, cold, rain, power failures and vandalic acts. Can automatically send SMS alert for maintenance or alarms.
/P	FITTING	×	☑	☑	Paper ticket validation unit with dot matrix impact printer and endless replaceable ribbon.
/X	OPTION	☐	☐	☐	Contactless smart card validation unit with AEP multistandard reader.
/C	FITTING	×	☑	×	Contact smart card validation unit, with card retention and electromagnetic release.
/CUT	FITTING	☑	☑	☑	Corner cutting device to execute multiple validations on the same paper ticket. Not compatible with /C. Reduced voltage range (24V -10%+20%).
/PSA	FITTING	☑	☑	☑	PSA, industry standard mounting system for electronic validators. Exclusive, anti -vibrations, AEP "Spring-O-Lock" male pins on validator side. DIN 41622 connector.
/PSC	FITTING	☑	☑	☑	PSC, industry standard mounting system for legacy obliterators (male pins on support side). WPI 26-159-16 connector.
/PSL	FITTING	☑	☑	☑	PSL, industry standard mounting system for previous generation obliterators (/male pins on support side). WPI 26-159-16 connector.
/3POS	FITTING	☑	☑	☑	Fixed offset of the validation string on the paper ticket, so that leave free the first two lines.
/T3	FITTING	×	×	☑	Extended temperature range according IEC EN 50155 T3 temperature class. It includes general and display specific heating system.
/NOKBD	FITTING	☑	☑	☑	No user keyboard. Internal service keyboard anyhow present.
/ETH	FITTING	×	☑	☑	Ethernet interface is standard on F240A & F240B. This fitting is related to wiring of main connector only.
/USB	FITTING	×	☑	☑	USB interface is standard on F240A & F240B. This fitting is related to wiring of main connector only.
/WIFI	FITTING	×	×	☐	Wi-Fi IEEE802.11b/g interface. This is a fitting for F240B only, must be ordered with base model.
-WIFI	OPTION	×	☐	×	Wi-Fi IEEE802.11b/g interface. This is an option for F240A only, can be added at a later time.
-Wxx	FITTING	☐	☐	☐	Ticket entry slot xx mm wide - standard 45; 43,54,84 are available, different width upon request (subject to approval by AEP)
-UHF433	OPTION	×	☐	×	Legacy 433 MHz AEP communication module, according ETSI EN 300 220. Not recommended for new applications.
-UHF868	OPTION	×	☐	×	Legacy 868 MHz AEP communication module, according ETSI EN 300 220. Not recommended for new applications.
-GPRS	OPTION	×	×	☐	Internal GPRS modem for data communication.
-UMTS	OPTION	×	×	☐	Internal UMTS modem for data communication.
-Sxxxx	OPTION	☐	☐	☐	Customized key lock. "xxxx" is the required key code.
/AS	FITTING	☐	☐	☐	Special fitting upon customer's request. It may include body coloring, special cabling, personalized labels etc. Special fittings may require additional fee and/or minimum quantity.

☑ included in base model ☐ optional × not available

Order encoding

AEP products offer a great flexibility to satisfy the widest range of applications. For most products following configuration parameters are defined:

- **versions**, that identify the base type of machine. Different versions correspond usually to very different devices, even from visual point of view.
- **fittings**, that defines optional features to be selected at the time of construction. In general, the above said characteristics cannot be modified and/or modified at a later time in an easy way.
- **options**, that specify features that can be added or removed even after the construction of the product, without the need of returning it to the factory.
- **accessories**, other products which can be easily used together with this unit.

Please refer to the above table for ordering codes of all available versions, fittings and options. Unless otherwise indicated, they can be combined each other.

Sample ordering code

F240B/PX /PSA /ETH /WIFI -W45

F240B validator with contactless reader, for PSA mounting support, wired for Ethernet, with WI-FI module. Ticket slot 45 mm wide.

Warranty and support

Any AEP product has 12 months basic warranty against defects or failures. In this period of time, products will be repaired free of charge at AEP factory or at any AEP Technical Support Center.

AEP grants support service and spare parts availability for 10 years since end of production of the purchased model.

Base models technical data summary

Specification	F240/P	F240A	F240B
Architecture	μC	Master/slave	Single core
CPU	μC	SCBM2	SCBM2
Clock MHz	14.7	50	50
SRAM	2K	2M	2M
DRAM	×	8M	8M
FLASH	60K	2M+384K	2M+384K
SD card	×	1x2G	1x2G
RTC	☑	☑	☑
Battery	Soldered	Soldered	Holder
Watchdog	☑	☑	☑
Display	α 2x16 24x99 mm	α 2x16 24x99 mm	graph 128x64 70x40 mm
Keys	5	0	5
Beepers	2	0	3
LEDs	3	0	4
RWS	☑	☑	☑
Digital Out	1	2	2
Digital In	1	2	2
3 x position In	×	☑	☑
Auto switch on	×	☑	☑
Auto switch off	×	☑	☑
Activate in	×	☑	☑
Reversed voltage protection	☑	☑	☑
Voltage measurement	☑	☑	☑
Temperature measurement	☑	☑	☑
DIP switches	×	4	1
Contactless reader (/X)	×	☐	☐
Contactless reader SAMs	×	4	4
Contactless reader antenna	×	Active	Passive
RS-232 3-wire	☑(1)	☑	☑
RS-232 6-wire	×	☑	☑
RS-485	☑(1)	☑	☑