Alphanumeric Operator Display

Factory Built-in Option for FCX Keyboards

TECHNICAL OVERVIEW

Description and Application

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[TIPRO]

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A. GENERAL INFORMATION

The Alphanumeric Operator Display module is a combination of an alphanumeric display and the electronic board which controls the display and communicates to Tipro Controller within the FCX keyboard and optionally also directly to the computer (see Figure below). Currently, there are four different LCD displays available (see chapter A.2), as well as two types of the electronic board.

The first board type (the "**standard version**") is a pure Tipro bus module that connects only to the Tipro Controller. With this one the computer controls the display via Tipro Controller using Tipro run-time software support, i.e. OPoS/JPoS drivers or API.

The other board type (the "**ESC/PoS version**"), besides Tipro bus, provides two additional interfaces: RS232 and USB (as virtual COM port) supporting ESC/PoS protocol. Therefore the display can be operated directly (without Tipro Controller) from computer via either direct cable connection to RS232 computer port or via USB cable of the FCX keyboard (through USB hub of the Tipro controller).

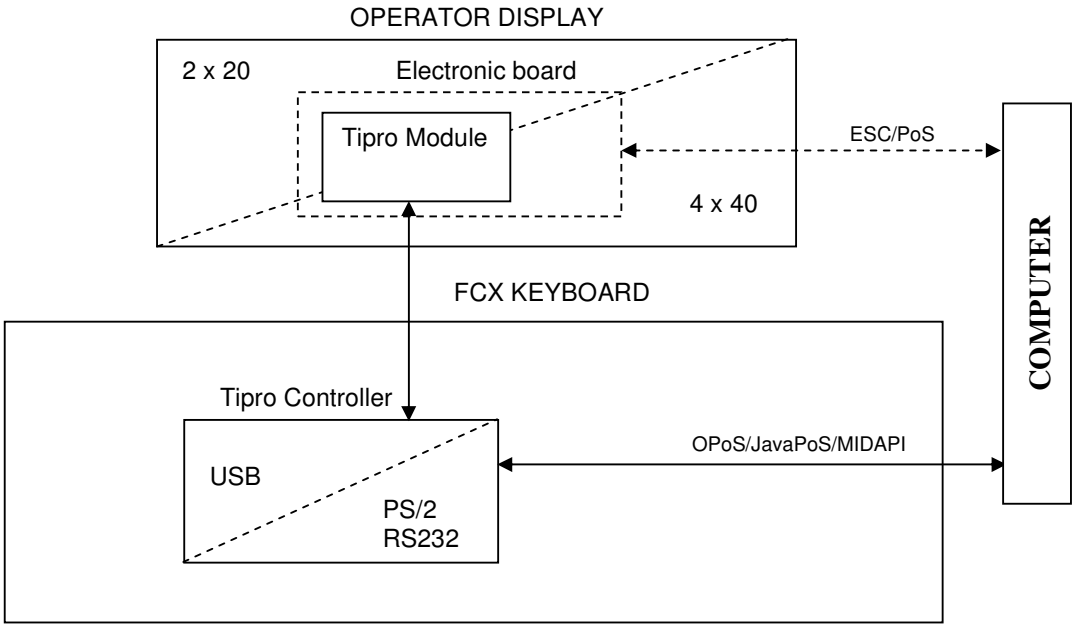

Figure A.1. – Conceptual Connection Diagram

A.1. Highlights

Features:

- Factory built-in option for FCX keyboards
- Adjustable inclination (-20º to +45º)
- LCD 2 lines by 20 large font characters (9.6mm) with LED backlight or
- LCD 4 lines by 40 small font character (4.9mm) with LED backlight
- Connection: internal Tipro bus
- Optional interfaces for ESC/PoS: RS232 or USB (as virtual COM)
- Additional +5V power supply required (except for USB primary controller interface and edge LED backlight)

A.2. Display Technologies

Type	Size	Character Size (W × H [mm])	Text Color	Background Color	Backlight
LCD	2×20	6 × 9.6	Dark Gray	Yellow/Green	LED - ARRAY
LCD	2×20	6 × 9.6	White	Blue	LED - EDGE
LCD	4×40	2.8 × 4.9	Dark Gray	Yellow/Green	LED - ARRAY
LCD	4×40	2.8 × 4.9	White	Blue	LED - EDGE

NOTE 1:

In case of the Blue/White LCDs (2x20 and 4x40) the additional power supply (TM-VPA) is not needed for all possible primary keyboard interfaces (USB, PS/2 + RS232)

NOTE 2:

In case of the USB primary keyboard interface the additional power supply is not needed for all possible LCD displays, providing that the keyboard is connected to a self-powered or root hub (500mA current rating) and not to a bus-powered hub (100mA current rating)

B. CONFIGURATIONS AND OPERATING MODES

B.1. Operator Display as Standard Tipro Module

The **standard version** of the electronic board in the Operator display is a Tipro module, internally connected by Tipro bus to the Tipro controller built into the FCX keyboard. Depending on the version of Tipro controller, the display can be operated either via USB or PS/2+RS232 communication. Result is always only one (1) cable from keyboard + display to the computer.

B.1.1. Via USB Controller

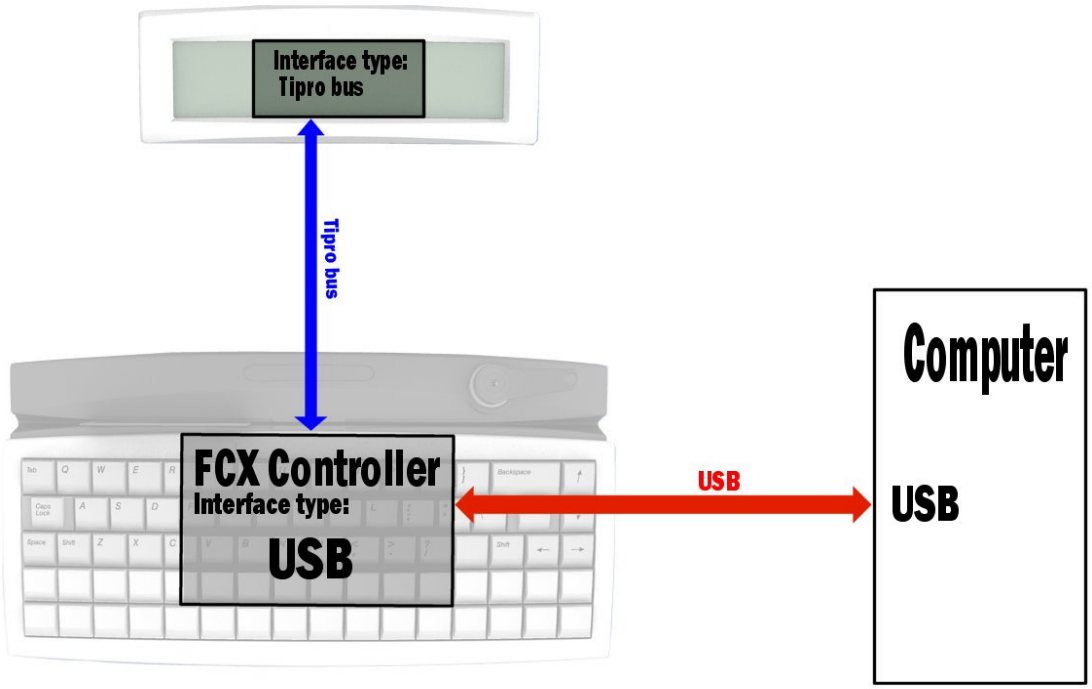

Figure B.1. - Standard Tipro module via USB Controller

Ordering codes example: FCX-080-**U**RI-L**T**–C15C10 (keyboard)
TM-CU1 (cable)

The Operator display is internally connected to the FCX Controller, located in the keyboard, via Tipro bus. FCX Controller is then externally connected to the computer via USB.

In this configuration the application software controls the display using Tipro's USB OPoS/JPoS drivers or MIDAPI.

B.1.2. Via PS/2 + RS232 Controller

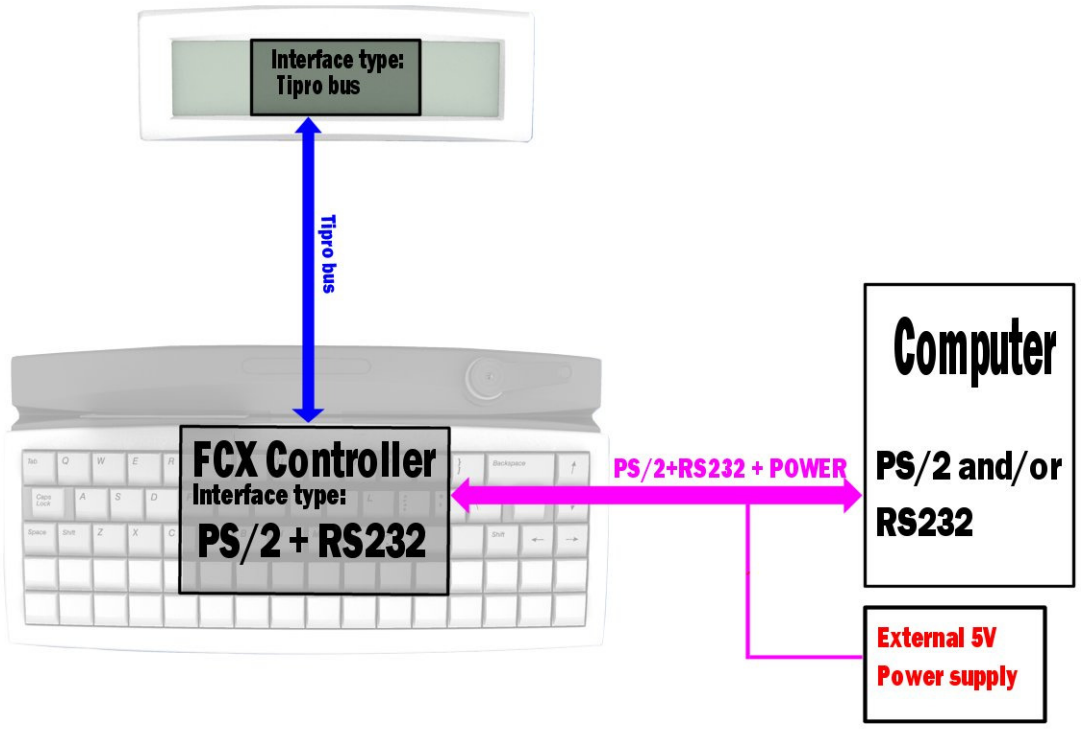

Figure B.2. - Standard Tipro module via PS/2 + RS232 controller

Ordering codes example: FCX-080-**P**RI-L**T**-C15C10 (keyboard)
TM-CWA (cable) *
TM-VPA (power supply) *

* In case of Blue/White LCDs the additional powers supply TM-VPA is not needed, so the TM-CSA (PS/2 + RS232) cable can be used instead of TM-CWA

The Operator display is internally connected via Tipro bus to the FCX Controller. The FCX Controller is externally connected via a special triple-end cable (PS/2 + RS232 + Power) to the computer and the power supply.

In this configuration the application software controls the display using Tipro's RS232 OPoS/JPoS drivers or MIDAPI, but it is possible exclusively via RS232. Other keyboard built-in options (e.g. keys, Keylock, iButton, …) can be interfaced via either PS/2 or RS232, but it is strongly recommended to use the PS/2, so the RS232 is reserved for the display only.

B.2. Operator Display with ESC/PoS Protocol Support

The **ESC/PoS version** of the electronic board is a pure superset of the **standard version**. So, besides all of the features described in the previous chapter, it is also capable of executing ESC/PoS commands received directly from the computer either via RS232 (variant **R**) or USB as virtual COM port (variant **U**).

B.2.1. Via RS232

a) Standard RS232

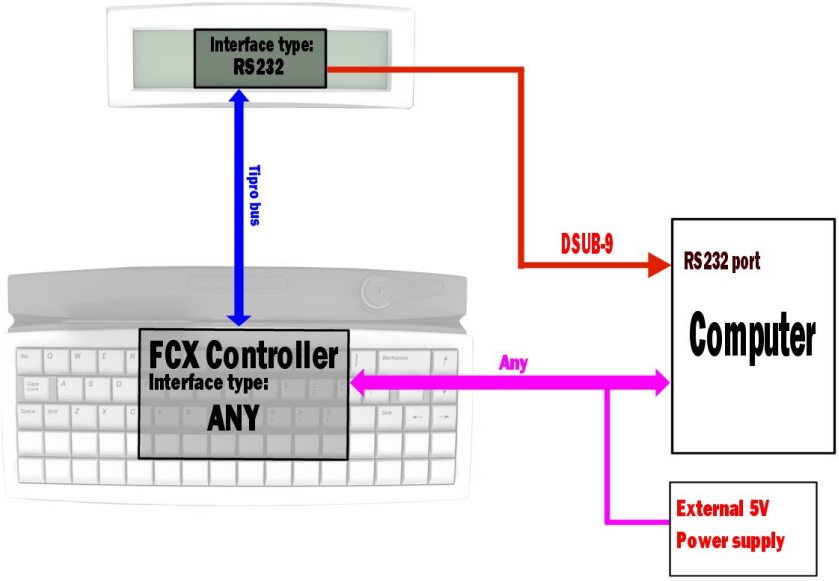

Figure B.3. - Display operated directly by computer via standard RS232 port

Ordering codes example: FCX-080-PRI-L**R**-C15C10 (keyboard)
TM-CWA (cable) *
TM-VPA (power supply) *
TM-CGJ (cable)

* In case of Blue/White LCDs the additional powers supply TM-VPA is not needed, so the TM-CSA (PS/2 + RS232) cable can be used instead of TM-CWA

In this configuration the Operator display with RS232 interface is externally connected directly to the computer's RS232 port. If the FCX controller is PS/2 + RS232 type then an external 5V power supply is also needed except for the Blue/White LCDs.

b) Powered RS232

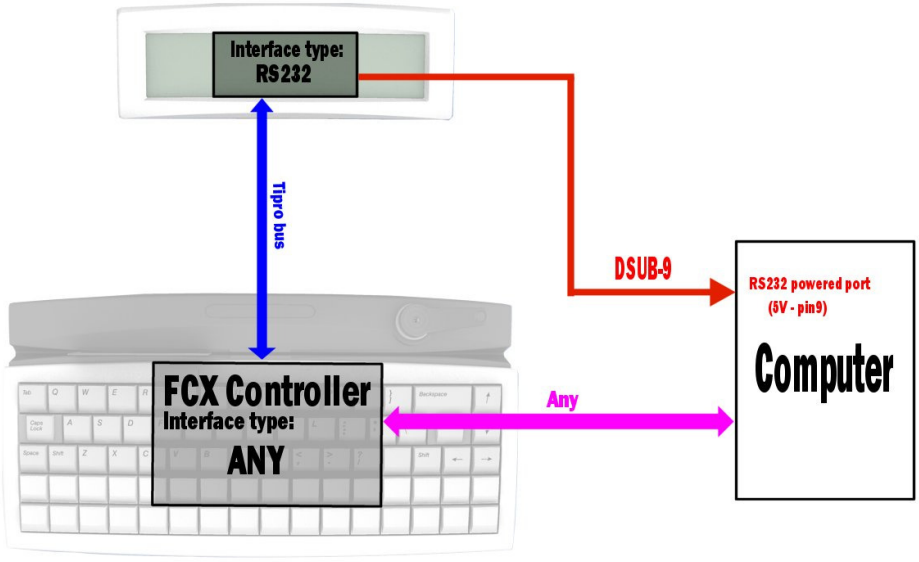

Figure B.4. - Display operated directly by computer via 5V powered RS232 port

Ordering codes example: FCX-080-PRI-L**R**-C15C10 (keyboard)
TM-CSA (cable)
TM-CGJ (cable)

In this configuration the Operator display with RS232 interface is externally connected directly to the computer's powered RS232 port via a DSUB-9 connector which must provide +5V power at pin 9 with current rating of at least 500mA.

B.2.2. Via USB (Virtual COM Port)

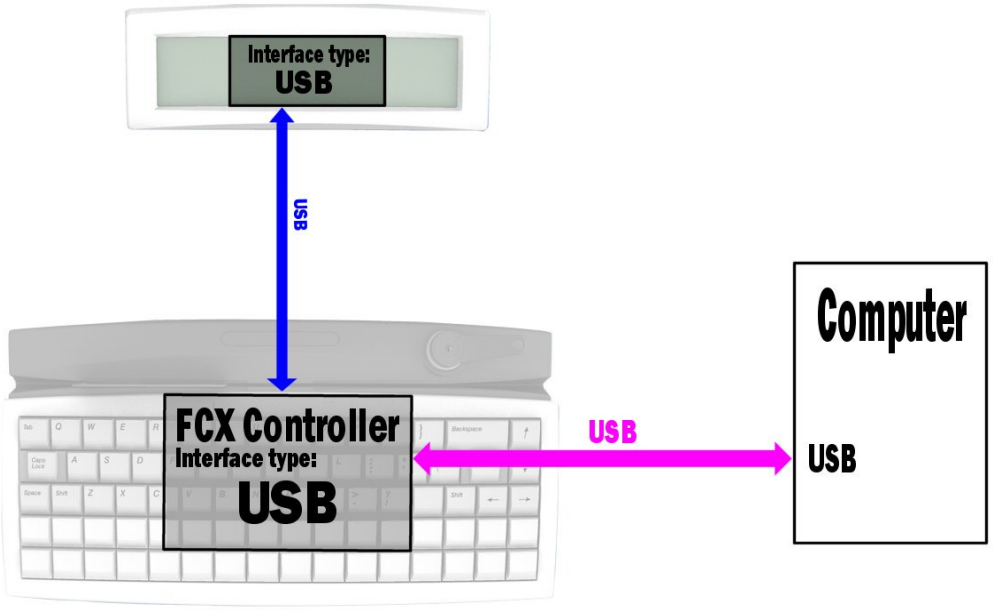

Figure B.5. - Display operated by computer via USB port (as virtual COM port)

Ordering codes example: FCX-080-URI-LU-C15C10 (keyboard)
TM-CU1 (cable)

The Operator display with USB interface is internally connected to the USB hub on the USB FCX Controller. The Controller is externally connected to a USB port of the Computer with single cable.

NOTE:

A virtual COM port is not a 100% compatible replacement of a "real" COM port, as it is physically USB. With virtual COM, after USB interface being logically reconnected (e.g. device reset, USB-cable hot-plugged, power supply interrupted, ...), the virtual COM port must be logically reconnected since the relevant driver has been reloaded.

A virtual COM port probably will not work satisfactory in SW applications that were originally designed with a real COM port in mind. After USB being reconnected, such applications may lose COM functionality or even block in the next attempt to communicate. Therefore, we can recommend the virtual port only for an SW application that was designed considering the USB complexity. Such application should be able to detect the USB reconnect event, and logically disconnect/reconnect the virtual COM port afterwards.

C. ORDERING CODES

1	2		3		4	5	6		7	8	9		10		11
F	**C**	**X**	**-**	**0**	**8**	**0**	**-**	**U**	**R**	**I**	**-**	**Q**	**U**	**G**	**-**	**C**	**_**	**_**	**-**

Compact keyboard

2 Matrix alignment

X : X-Y matrix

3 Housing size

080 : Max 80 keyswitches

060 : Max 60 keyswitches

4 Controller type

A : PS/2

P : PS/2 + RS232

U : USB

5 Card reader

R : MCR ISO Tracks 1+2+3

0 : None

6 Identification module

I : iButton

K : Keylock (2-position lock, two identical keys)

0 : None

7 Integrated Display

L : LCD 2 × 20 Large fonts, Yellow/Green

B : LCD 2 × 20 Large fonts, Blue/White

Q : LCD 4 × 40 Small fonts, Yellow/Green

M : LCD 4 × 40 Small fonts, Blue/White

8 Integrated Display Interface

T : Tipro Bus

R : RS232

U : USB

9 Integrated pointing Device (optional)

G : Integrated mini touchpad (2×2)

T : Integrated full-size touchpad (3×4)

10 Color

11 Custom version (optional)

D. APPENDIX

D.1. Supported ESC/PoS Commands

COMMAND			
#	**ASCII**	**NAME**	**HEX**
1	BS	Backspace	08
2	HT	Horizontal tab	09
3	LF	Move cursor down	0A
4	US LF	Move cursor up	1F 0A
5	HOM	Move cursor to home position	0B
6	CR	Move cursor to left-most position	0D
7	US CR	Move cursor to right-most position	1F 0D
8	US B	Move cursor to bottom position	1F 42
9	US $	Move cursor to the specified position	1F 24 *n m*
10	CLR	Clear display screen	0C
11	CAN	Clear cursor line	18
12	ESC =	Select peripheral device	1B 3D n
13	ESC @	Initialize display	1B 40
14	ESC R	Select an international character set	1B 52 n
15	US MD1	Select overwrite mode	1F 01
16	US MD2	Select vertical scroll mode	1F 02
17	US MD3	Select horizontal scroll mode	1F 03
18	US C	Turn cursor display mode on/off	1F 43 *n*
19	US E	Set display blink interval	1F 45 *n*
20	US T	Set & display time counter	1F 54 *h m*
21	US U	Display time counter	1F 55
22	US X	Set brightness (for VFD only)	1F 58 *n*
23	US @	Execute self test*	1F 40

Notes:

1. Window definition is not supported, i.e. window size is always full display area
2. Unsupported commands should not be used as they may interfere with decoding of the supported ones if used within a sequence

D.2. Supported National Character Sets

The command **ESC R n** selects the international character set **n** as follows (default value is zero, i.e. US character set):

n		Character code (Hex)											
		23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
0	US	#	$	@	[	\	]	^	`	{	|	}	~
1	France	#	$	à	°	ç	§	^	`	é	ù	è	¨
2	Germany	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
3	UK	£	$	@	[	\	]	^	`	{	|	}	~
4	Denmark 1	#	$	@	Æ	Ø	Å	^	`	æ	ø	ő	~
5	Sweden	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	ő	ü
6	Italy	#	$	@	°	\	é	^	ù	à	ò	è	ì
7	Spain 1	Pt	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
8	Japan	#	$	@	[	¥	]	^	`	{	|	}	~
9	Norway	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	ő	ü
10	Denmark 2	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	ő	ü
11	Spain 2	#	$	á	¡	Ñ	¿	é	`	í	ñ	ó	ú
12	Latin Am.	#	$	á	¡	Ñ	¿	é	ü	í	ñ	ó	ú
13	Korea	#	$	@	[	₩	]	^	`	{	|	}	~
14	Slovenia	#	$	ž	š	đ	ć	č	ž	š	đ	ć	č

D.3. Supported Character Code Table

The display can only operate in the **Page 19** (**PC858: Euro**), as it doesn't support "ESC t" command. Due to an internal hardware limitation it can not display all the characters within the page (replaced with blank), but only those listed in the table below. It should be noted that some characters may appear at the display in somewhat different style.

D.4. Unsupported DM-D110 Commands

COMMAND			
#	**ASCII**	**NAME**	**HEX**
1	ESC %	Select/cancel user-defined character set	1B 25 *n*
2	ESC &	Define user-defined characters	1B 26 ...
3	ESC ?	Cancel user-defined characters	1B 3F *n*
4	ESC t	Select character code table	1B 74 *n*
5	ESC W	Set/cancel window range	1B 57 ...
6	US r	Set/cancel reverse characters	1F 72 *n*
7	US v	Set status confirmation for DTR signal	1F 76 *n*
8	US :	Start/end macro definition	1F 3A
9	US ^	Execute macro	1F 5E *n m*
10	US (A	Select display(s)	1F 28 41 …
11	US (E	User setting command	1F 28 45 …