Product Change Notification

PCN No: 2006-08-10-01
Report Date: August 10, 2006
Subject: LK402-25 PCB 2.0 New Board Revision Release

List of New Products:
LK402-25 PCB 2.0 including all applicable extensions and combinations

-YG (display colour)
-VPT, -V, -E (power and temperature options)

Reason for Change:
The LK402-25 Matrix Orbital module series is the replacement for our old module LK402-12. The LK402-25 is upgraded to offer new features and benefits; the physical connections on the PCB boards have been standardized and the components are now RoHS compliant.

Product Change:
The following list of hardware and firmware changes are all effective on all the variants of the LK402-25 as stated under 'List of New Products'. The old LK402-12 PCB 2.0 is now superseded by LK402-25 PCB 2.0, and the old firmware version v2.1 is now superseded by v5.0. The changes are stated to compare the old and the new PCB revisions.

Hardware Changes:
1) There are 25 keys in the LK402-25 versus the old LK402-12 that had 12 (3x4) matrix style keypad connector. Other differences between the revisions are:
   - physical placement of the connectors has been standardized across all

our products
- LK402-25 PCB 2.0 offers additional grounding and grounding or 5V (selectable) pins on the keypad connector, hence there are 12 pins on the keypad connector
- LK402-25 PCB 2.0 keypad connector has been standardized. The middle pins to be column1, and row 5.
- LK402-25 PCB 2.0 have improved ESD protection on the keypad connectors with incorporated resistors.

2) The LK402-12 PCB 2.0 had seven general purpose outputs. The LK402-25 PCB 2.0 has six general purpose outputs. The differences between the revisions are:
- LK402-12 had active low GPOs, and LK402-25 has active high GPOs. Active low GPOs mean that turning the GPO on will make the GPO pin go low (0V). Active high GPOs mean that turning the GPO on will make the GPO pin go high (5V)
- LK402-25 GPO connectors have 2 additional pins for ground and 5V.

3) Physical placement of the DB9 connector is different in LK402-25 PCB 2.0 to conform with our other products.

4) The connector for the Dallas 1-Wire does not come readily when ordering modules, it must be specified. Please contact a sales representative for details.

5) To provide more multilingual (European) support to our modules, we have started using European font displays with the LK402-25's. Please see the following character set for the European font display and the (old) Japanese font display for comparison.

European Font Character Set

Japanese Font Character Set

D7 D6 D5 D4 / D3 D2 D1 D0	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0 0 0 0 — 0				0	@	P	`	p			—	タ	ミ	三	P
0 0 0 1 — 1			!	1	A	Q	a	q			。	ア	チ	ム	9
0 0 1 0 — 2			"	2	B	R	b	r			「	イ	ツ	メ	B	θ
0 0 1 1 — 3			#	3	C	S	c	s			」	ウ	テ	モ	ε	∞
0 1 0 0 — 4			$	4	D	T	d	t			、	エ	ト	ヤ	μ	Ω
0 1 0 1 — 5			%	5	E	U	e	u			・	オ	ナ	ユ	σ	Ü
0 1 1 0 — 6			&	6	F	V	f	v			ヲ	カ	ニ	ヨ	ρ	Σ
0 1 1 1 — 7			'	7	G	W	g	w			ア	キ	ヌ	ラ	g	π
1 0 0 0 — 8			(	8	H	X	h	x			ィ	ク	ネ	リ	√	x
1 0 0 1 — 9			)	9	I	Y	i	y			ゥ	ケ	ノ	ル	⁻¹	y
1 0 1 0 — A			*	:	J	Z	j	z			ェ	コ	ハ	レ	j	千
1 0 1 1 — B			+	;	K	[	k	{			ォ	サ	ヒ	ロ	×	万
1 1 0 0 — C			,	<	L	¥	l					ャ	シ	フ	ワ	¢	円
1 1 0 1 — D			-	=	M	]	m	}			ュ	ス	ヘ	ン	÷	÷
1 1 1 0 — E			.	>	N	^	n	→			ョ	セ	ホ	゛	ñ	
1 1 1 1 — F			/	?	O	_	o	←			ッ	ソ	マ	゜	ö	▮

We started using European font displays with LK402-25 modules in April, 2006. Please contact your sales representative to confirm which character set your module will be arriving with. You can also request your sales representative for a character set preference you may have.

Firmware Changes:

Release v5.0 (released July 6, 2006):

1) Keypad keys are now user definable: Command 254/213/<50 bytes>
   All values returned from the keypad are now user-defined. This command
   uploads the new key mapping. The first 25 bytes are the key down values,
   while the last 25 are the key up values. The default values for key down
   are capital letters starting from `A' and the default values for key up are
   small letters starting from `a'. This is can be the work around for the
   hardware constraint for the old keypad systems as described in Hardware
   Changes item # 1

2) We now offer 16 bytes of EEPROM for the customers

   - Customer data upload: Command: 254/52/<16 bytes>
   - Customer data download: Command: 254/53
   The display now has 16 bytes to store whatever the customer would like.
   These 16 bytes can be used for anything including serial numbers,
   addresses, or whatever you can think of that will fit in 16 bytes.

3) Added a watch dog timer: The units now make full use of a watchdog
   timer to prevent the display from remaining locked up. The default
   timeout is approximately 2.1 seconds (depending on ambient
   temperature). Upon a watchdog reset the display will send 254/212 to the
   host to indicate that watchdog has reset the module.

4) The old LK402-12 used to have an 80-byte buffer. We have increased the
   buffer size to 128 bytes in PCB 3.0.

5) RS232 speed (baud rate) now takes different parameter values:
   - Command 254 / 57 /
   The following are the parameter values according to baud rate:

Parameter	Baud Rate
83	1200

Parameter	Baud Rate
41	2400
207	4800
103	9600
51	19200
34	28800
25	38400
16	57600

6) Baud rate can now be fine-tuned

- Command 254 / 164 / <speed low byte><speed high byte>

We now offer access to the baud rate generator registers in the uC so that users may be able to fine tune baud rates as necessary.

This command accepts 2 byte parameter which is derived from the equation:

$$speed = (8,000,000 / 8 \text{ x desired baud rate}) - 1$$

Please see the manual for details on the use of this command. There are caveats as to how to use this command in the manual.

7) I2C now properly ACKs and NAKs the master when it is addressed

I2C now sends a NAK when the module is busy or when the communication buffer is full. Since the module uses the same In and Out buffer with the RS232, there are commands necessary to be able to configure the buffer accordingly. These commands are:

- Command 161: Clear Out buffer – since I2C transactions are master-initiated, the replies of the slave module are placed in an Out buffer (16 byte buffer) until the master decides to read. If for some reason the master is out of sync with the data in the Out buffer because it did not clock the data out when it was supposed to, the master has the option of clearing the Out buffer but then it would have to re-send query commands and clock the data out from the module immediately after (provided the end of the command, so all the parameters should be clocked to the module first).

- Command 160: Set RS232 Tx Data <on/off> - just like how Out buffer is shared between I2C and RS232, so is the In buffer. Because of this there is a need to tell the module if data is coming from RS232 or from I2C. When this command is sent with parameter 0 (off), this hints that the data is from I2C, and that data responses in the Out buffer are checked against a flag that holds the value of the parameter for this command. When the parameter is 0 (off) the data remains in the Out buffer and NOT transmitted out via RS232. When the parameter is 1 (on – default case) the data responses are automatically transmitted via RS232. This command MUST be issued with parameter 0 when in I2C and expecting to read the module. The default for this flag is on, which means the module will send its reply or report via RS232.

- Command 163: Dump Out buffer via RS232 – this command is used to dump the Out buffer via the RS232. In the case that command 160 is sent with parameter = 0, the data responses are placed in the Out buffer and can be accessed via RS232 using this command.

8) The Init Narrow Vertical Bar command (115) now needs extra initialization before use. The custom characters that make up the narrow vertical bar needs to be sent via command Store Custom Chars (193) and loaded by Load Custom Chars (192)

- Command 193: Store Custom Characters: 254 / 192 / <bank> / <Id> / <8 char definition>

This command stores the custom chars in the EEPROM in the <bank> specified. Eg if the user specifies bank 1, he may be making custom chars for horizontal bars, and he may utilize these custom chars by sending commands 104 and 124 (Init Horizontal Bar and Place Horizontal Bar), but he also may make a totally different set of custom chars that he may load whenever he wants by using the following command. The definition for the old horizontal, vertical, medium numbers are all default in the module.

- Command 192: Load Custom Characters: 254 / 192 / <bank>

This command loads the custom chars defined in the <bank> specified. Again, for the example above, the user may send this command with bank 1 as parameter, and he may now use the characters just by issuing the Id (which is 0x00 to 0x07).

9) The display now has an enhanced data locking capability. The users can now lock the module in different levels.

- Command 202: Set Data Lock: 254 / 202 / 245 / 160 / <level>

- Command 203: Set and Save Data Lock: 254 / 203 / 245 / 160 / <level>

Level is an 8-bit value with the following bits defined:

bit 7 – when this bit is 1, users can not display anything on the module
bit 6 – when this bit is 1, users can not send any commands to the module but commands 202 / 203
bit 5 – reserved and should be left 0
bit 4 – when this bit is 1, users can not alter the module settings (internal EEPROM)
bit 3 – reserved and should be left 0
bit 2 – reserved and should be left 0
bit 1 – reserved and should be left 0
bit 0 – reserved and should be left 0
Eg: to lock the display (no text will be displayed) send command: 254 / <202 or 203> / 245 / 160 / 128
Eg: to lock the display propertied (no commands will be followed, with the exception of the Data lock command) send command: 254 / <202 or 203> / 245 / 160 / 192

10) Horizontal bar graph change. Only one directional horizontal bar graph can appear on the screen at a time. Either left facing or right facing horizontal graph can be used at a time. Trying out both directions within the same screen will garble the bars. If this is an issue with your design, please contact a Sales Rep for your options.

11) Firmware version 5.0 has control character 0x0A implemented as follows: When the display is at the last row (row 2) and 0x0A is sent, the module inserts a new line and puts the next insertion point on the start of the new line. With the old firmware version 2.1, when 0x0A is sent when the display is at the last row, the next insertion point goes back to home position; there is no scrolling of the text.

12) List of New or Changed Commands:

Keypad Related Commands:

213: Assign Keypad Key ID

- new command, as described in item #1 under Firmware Changes

RS232 / I2C Related Commands:

57: Set Standard Baud   - new command, as described in item # 5

164: Set Non Standard Baud - new command, as described in item # 6

160: Set RS232 Tx Data   - new command, as described in item # 7

161: Clear Out buffer   - new command, as described in item # 7

163: Dump Out buffer via RS232   - new commandas, described in item # 7

Special Characters Related Commands:

115: Init Narrow Vertical Bar   - changed, as described in item # 8

124: Place Horizontal Bar   - changed, as described in item # 8

192: Load Custom Characters   - new command, as described in item # 8

193: Store Custom Characters   - new command, as described in item # 8

Module Property Query Commands:

52: Write Customer Data   - changed, as described in item # 2

53: Read Customer Data   - changed, as described in item # 2

Display Screen Control Commands:

202: Set Data Lock   - new command, as described in item # 9

203: Set and Save Data Lock   - new command, as described in item # 9

Please see the manual for in depth details.

Contact Information:

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Reference Documents/Attachments:

Location: http://www.matrixorbital.ca/manuals/

Approvals:

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