DPS-Promatic X4 Analog expander
Instruction list

Rev 1.0

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Disclaimer: read carefully!

1. This system is intended for trained people, not for consumers. If you feel you don't understand some technical aspects please refer to somebody that has a technical background.
2. In this manual we may use CAPITAL LETTERS or lower case letters. If we write 'E' we mean it. You can't use 'e' because it won't work.. The system IS CASE SENSITIVE.
3. We have done our best to produce a bug free device and to explain features well into this document. We will not be liable for anything exceeding the simply repair or fixing of problems, if due to us, once they have been submitted to us

Introduction:

DPS-Promatic has developed a microprocessor controlled Analog to serial (RS232) converter with 3 inputs with 10 bit resolution and 1 input with 16 bit resolution. The X4 board can be used in conjunction with a TCS 3.5 to expand the number of analog inputs or can be used by itself, connected to a PC via RS232 port to read analog signals.
The X4 board accepts 4-20 ma signals as well as 1-5V signals. It can be powered by a 9VAC transformer or directly by a TCS 3.5 BOX.

In details the X4 board can be entirely set through the RS232, **for each of the 4 analog inputs**

- a real value can be assigned to the minimum level (4ma)
- a maximum value can be assigned to the maximum level (20ma)
- Unit of measure can be defined
- 2 upper level alarms (pre-alarm and alarm) can be programmed
- 2 lower level alarms (pre-alarm and alarm) can be programmed
- Actual level data can be polled continuously via RS232
- Alarm events are communicated through the RS232

RS-232 connections:

The X4 board can be connected to a PC (Personal computer) via RS232 at 9600 bps, parity none, 8 bits, 1 stop bit.
Please see the "X4 Block diagrams" for RS232 cable schematic.

Power supply:

The X4 board can be powered directly with 8 to 16 VAC or 12 to 24VDC
Please see the "X4 Block diagrams" X4 power supply cable

X4 Commands:

Any command sent by SMS must be preceded by # and MUST be in CAPITAL letters. For any ANALOG INPUT there is a message (#AMS), that can be programmed by you and that can be up to 40 characters long.

Command list:

#AMS	Set SMS [12...15] alert message
#ANR	Reads analog value
#ANS	Setup
#INI	Init to default value
#MTX	Associates an event (alarm) to a set of telephone numbers
#REG	System register
#RES	Restart X4 (warm reset)

HOW TO drive X4 expansion board through TCS 3-5

Quick start example:

1) We have a level probe with 4-20mA output to measure a water tank.
2) We want receive a SMS when the tank is empty or overfilled.
3) Our probe specification is:
   4mA = 0 mm
   20ma = 2000mm

TCS 3.5 commands

```
#EX4=ON                                  <- to enable the X4 function on TCS 3.5
#TEL01=300123456                         <- GSM number will receive the SMS alert
```

If you send commands to X4 via TCS 3.5 (via SMS or data call) must add the "X" prefix to X4 commands.

```
#XANS01=ON, mm, 0, 2000,100,300,800,900  <- Setup analog channel 1 parameters
#XMTX12=10000000                         <- Enable channel 1 SMS alert on TEL01
#XAMS12="Level alert in WATER TANK"      <- Description of alert (max 40 chars)
```

TCS 3.5 Commands involved:

#EX4	Enable/disable X4 capability on TCS-3.5
#X	Send command to X4 board connected via RS232 serial port

Command	:#EX4
Description	:Enable/disable X4 capability on TCS-3.5
Syntax	:#EX4? #EX4[=]<status>
Examples:	
	#EX4?
	#EX4=ON
	#EX4=OFF

Command :#X
Description : Send command to X4 board connected via RS232 serial port
WORKS ONLY VIA SMS OR DATA CALL !
Examples: "#XMTX12=10000000" send to serial port "#MTX12=10000000"

X4 expansion board related commands:

Command :#MTX
Description :Matrix 12..15. Associates an event (alarm) to a set of telephone numbers (from 1 to 8 or 0 for none) to which it will send an alarm SMS.
#MTX12 is related to 4-20 ma analog input alarm 10 bit (AN1)
#MTX13 is related to 4-20 ma analog input alarm 10 bit (AN2)
#MTX14 is related to 4-20 ma analog input alarm 10 bit (AN3)
#MTX15 is related to 4-20 ma analog input alarm 16 bit (AN4)

Syntax Please refer to http://www.dpspro.com/tcs_commands/tcsos_mtx.html

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Command :#AMS
Description :Stores and reads the text for alarm specific SMS messages
Syntax :#AMS?
#AMS<xx>?
#AMS<xx>[=]<message>
#AMS12 is related to CHANNEL 01 alarm
#AMS13 is related to CHANNEL 02 alarm
#AMS14 is related to CHANNEL 03 alarm
#AMS15 is related to CHANNEL 04 alarm

Command: :#ANR
Description: :Reads an analog channel
Syntax :#ANR<xx>?
Example:
#ANR01?
ANR01=85 C

#ANR03?
ANR03=258 cm

Command :#ANS
Description :Setup analog channel
Syntax :#ANS<xx>? or
#ANS<xx>[=]<status><,desc>
<,zeroScale><,fullScale><,lowerT>
<,lowT><,hightT><,higherT>

- <xx> = channel: 01,02,03,04
- <status> = ON, OFF (enable SMS alert)
- <desc> = 2 chars
- <zeroScale> = value at 4mA
- <fullScale> = value at 20mA
- <lowerT> = Lower Threshold
- <low> = Low Threshold
- <hightT> = High Threshold
- <higherT> = Higher Threshold

Example: we have a 4-20mA temperature probe
At 4mA -50 C degree
At 20mA 150 C
#ANS01=ON,C,-50,150,-10,0,20,50

Example 2: we have a 4-20mA gasoline level probe
At 4mA -0 mm
At 20mA 2000mm C
#ANS04=ON,mm,0,2000,200,300,450,800

X4 – PC Short commands protocol:

When the X4 is connected to a PC, an application program running on PC ,can poll the board to check analog inputs status with an one byte command:

Short command STATUS HEX code 01 (CTRL-A)
When X4 is polled with STATUS command, it checks the analog value for inputs 1 to 4. If all values are in the normal range, the X4 answer a '0' (HEX code 30).
If one of this value is out of range the X4 answer a digit form '1' to '8' coded in this way:

STATUS = '1' alert analog channel 1
STATUS = '2' alert analog channel 2
STATUS = '4' alert analog channel 3
STATUS = '8' alert analog channel 4

Polling example:
PC->X4 STATUS
X4->PC '0' nothing to report
PC->X4 STATUS
X4->PC '1' Analog channel 1 is in alert

Short command DUMP HEX code 04 (CTRL-D)
If a STATUS answer if different from '0', the application program can read a human readable message sending the DUMP command

Example:
PC->X4 STATUS
X4->PC '0' nothing to report
PC->X4 STATUS
X4->PC '1' Analog channel 1 is in alert

PC->X4 DUMP
X4->PC "$MSG=10000000,Warning! 4-20mA ,AN01=6488 mm"

The X4 answer is composed by:

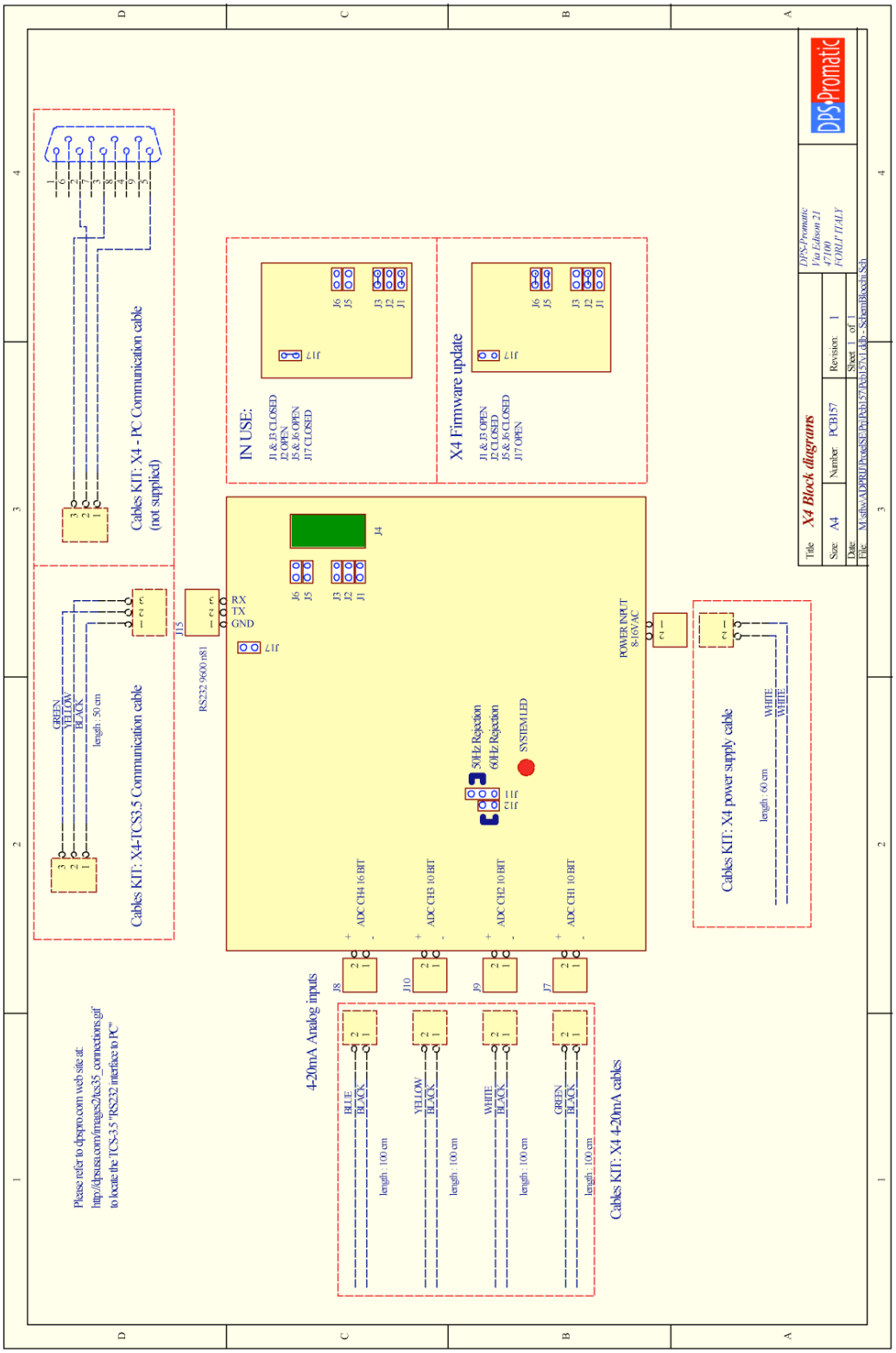
Prefix	*#MTX1x*	*Comma*	*#AMS1x*	*Comma*	*AN0x readout*
"$MSG="	10000000	,	Warning! 4-20mA	,	AN01=6488 mm

Where:
Prefix is a MESSAGE TAG
#MTX1x associates an event (alarm) to a set of telephone numbers
#AMS1x is the text for alarm
#AN0x is the analog value of related channel

Firmware update:

To update the firmware on the X4 board you need our MF58 Firmware Programmer
Please visit http://www.dpspro.com/mfp58_help.html for more information on MF58.

Jumper settings:
In the appendix "X4 Block Diagrams" you can see how set the jumper to upload the firmware.



X4- block diagram

