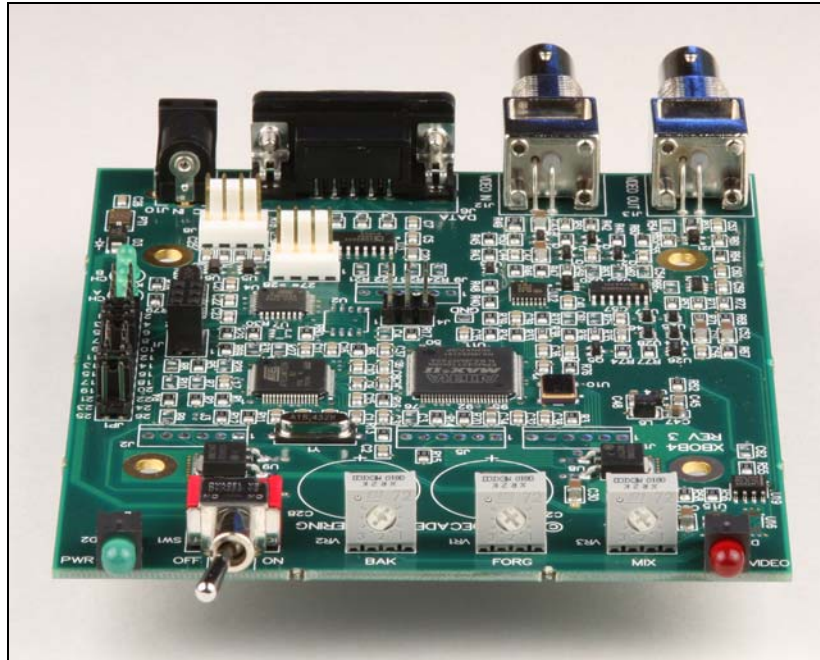


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XBOB-4E Addendum to XBOB-4 Application Guide

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Introduction

XBOB-4E is identical to the standard XBOB-4 in most respects; therefore the standard [XBOB-4 Application Guide](#) is applicable for most installation and programming requirements. Exceptions primarily related to the distance encoder interface, present only in XBOB-4E, are described in this document.

Changes to XBOB-4 Specifications

Power supply current: 140mA (typical) plus encoder power supply current.

Supplemental font memory: Not present.

Encoder Interface Specifications

Encoder type: 5V quadrature incremental; resolution specified by customer. Open-collector as well as “totem-pole” encoder outputs are acceptable. Internal pullups of 3.9K to +5V are provided.

Maximum rate: Greater than 200,000 phase transitions or 50,000 complete quadrature cycles per second.

Count range: -536,870,912 to +536,870,911.

Encoder Hookup

Caution! Some distance encoders MUST be installed with external current-limiting resistors in the power supply line. RST pipeline inspection systems are known to use such encoders. XBOB-4E satisfies this requirement by removal of the shunt plug at JP1 pins 13~14, which inserts 180 ohms in series. It is critically important to confirm encoder type at installation time. If the JP1 13~14 shunt is left in place when using encoders that require current-limiting resistance, encoder damage will result!

Distance encoders connect differently to the board and cabinet versions of XBOB-4E.

For the XBOB-4E circuit board without cabinet, use a Molex 22-01-2047 or equivalent crimp terminal housing, and connect a 5V incremental quadrature encoder directly to **J8** using pin assignments in the table below:

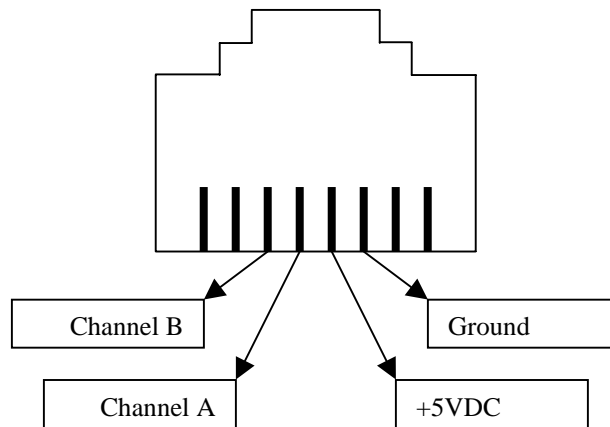
J8 Pin	Encoder Connection
1	+5VDC power to encoder; 200mA maximum; adds directly to XBOB-4E power supply current. Note that removal of JP1 shunt 13~14 inserts 180R in series to this pin.
2	Channel A signal (3.9K internal pullup to +5V)
3	Channel B signal (3.9K internal pullup to +5V)
4	Ground

Crimp contacts are often sold separately for this style of connector, and must be installed in the connector housing subsequent to wire attachment. Compatible insulation-displacement (IDC) or “punch-down” style connectors are also widely available. These require a punch-down tool instead of a crimper, and are more critical with regard to wire size, but they eliminate tedious wire stripping and crimping operations.

For the cabinet version (XBOB-4EC or XBOB-4EGC), a female RJ-45 style encoder connector is provided on the rear panel. Only the four center contacts are used. If telephone-style 8-conductor flat cable is installed with the blue wire on the left when looking at the face of the plug with latch side up, then wire colors at the encoder will be as follows:

Wire Color	Encoder Connection
Red	+5VDC power to encoder; 200mA maximum; adds directly to XBOB-4E power supply current. Note that removal of JP1 shunt 13-14 inserts 180R in series to this pin.
Green	Channel A signal (3.9K internal pullup to +5V)
Yellow	Channel B signal (3.9K internal pullup to +5V)
Black	Ground

If another type of plug and/or cable is used, please refer to this drawing for pin assignments as viewed looking into the rear-panel encoder connector:



Two LEDs are provided on the XBOB-4E board (D4 & D5; inside the cabinet) to confirm encoder and interface functionality. These LEDs track encoder A/B signal status visually: ON = logic high. OFF = logic low.

Application Programming

Two new ‘miscellaneous’ commands are available for use in XBOB-4E. **Note that “|” is the vertical bar, or ‘pipe’ symbol, not “1” or lower-case “L”.**

<CSI>100| Query the count register

The count is returned as a decimal string with leading polarity symbol (+ or -).

<CSI>101;m| Preset or clear the count register

m = value to be loaded. If **m** is omitted, zero is assumed (i.e. **<CSI>101|** clears the count). Note that “<” must be used instead of “-” to specify a negative count value.

SPI Device 2 (the encoder interface chip) must be enabled before the count register preset/query commands will work. XBOB-4E is pre-configured at the factory so customers don't normally need to do this. However, if default configuration settings are restored for any reason, then all SPI devices are disabled. To re-enable Device 2, see XBOB-4 v command (n=58). The complete sequence of commands is: <CSI>58;10v (enable Device 2) <CSI>1v (save configuration). Do not change the default SPI clock rate, and do not enable Device 0 (it's not present in XBOB-4E). The new configuration becomes effective next time XBOB-4E is powered up.

BASIC Programming example

The following example shows a simple method of retrieving and displaying distance information:

```
' Decade Engineering, Sept 30, 2008
' XBOB4-E BASIC Language Demo Program
' Simple demo for XBOB4-E. Clears the display, zeros the encoder, then loops,
'   reading the encoder value and printing it to XBOB4-E, until the escape key
'   is pressed.

CLS
PRINT "press escape key to exit"

'open com port for i/o
'open the com port
OPEN "com1:9600,n,8,1,CS0,DS0,RS" FOR RANDOM AS #1

'clear the screen
PRINT #1, CHR$(27) + "[2J";

'zero the encoder
PRINT #1, CHR$(27) + "[101|";

'loop until escape key is pressed
DO
  'check for keyboard input
  A$ = INKEY$

  'set cursor position
  PRINT #1, CHR$(27) + "[0;10H";

  'send query
  PRINT #1, CHR$(27) + "[100|";

  'get return value
  c = 0
  value$ = ""
  DO UNTIL (c = 10)
    digit$ = INPUT$(1, #1)
    c = ASC(digit$)
    IF (c > 10) THEN
      value$ = value$ + digit$
    END IF
  LOOP
  'convert string to integer
  numericvalue = VAL(value$)

  'scale the raw count here
  numericvalue = numericvalue * .1

  'print to screen
  PRINT #1, USING "+#####.#"; numericvalue;
'was keyboard escape key pressed?
LOOP UNTIL (A$ = CHR$(27))

'close the com port
CLOSE #1
```

Troubleshooting

If distance display operations fail, see comments under **Application Programming**.

The encoder interface chip in XBOB-4E isn't ready to communicate when boot script execution commences, so, for instance, a script command to clear the count register may fail. Suggested work-around: Begin the boot script with one or more vector commands to draw huge graphic objects off-screen, which will burn enough time for the encoder interface to be ready. Our next firmware release may include a Wait command to simplify this chore.