

Quest Bin Box



04/30/2004

P/N: **101415** - Rev. 00

USER'S MANUAL

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Quest Consulting Bin Box Users Manual

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Introduction

The **Quest Bin Box** is designed to display the signals that pass between the following IC Test Systems and an automatic IC Test Handler or SORT Probe System.

- **Megatest Q8000**
- **Megatest/Sytest Q2/52 and Q2/62**
- **EPRO 140/142/A/AX**
- **Other Test Systems (requires 'pigtail' adaptor cable)**

The Bin Box passes the “**Start Test**” signal (from Handler, Prober, or Bin Box) to the Test System, which then initiates the IC Test program. When the Tester finishes the test, the **EOT** (End-of-Test) signal and **Binning** signals are received by the Bin Box and displayed. These signals are also passed through the Bin Box to a Handler/Prober or other automated equipment, if installed.



The Bin Box also has a 4-Digit counter that displays the Test Time from the **Start Test** signal to the **End-of-Test** signal. At the “End-of-Test” the counter stops and displays the total test time.

The **Quest Bin Box** has the following features:

- A **Counter** displays the running ‘Test Time’ and freezes at the end of the test.
- A **LOOP** switch allows repeating a complete test (ex. continually run Self Tests).
- Can be interfaced to be used with **other Test Systems**.
- A **Start Test** signal can be initiated from the Bin Box ‘START’ switch.
- Can be located in a **convenient location** away from the Test System.
- With external +5V power, can be used as a “**general purpose**” **desktop timer**.
- Bin signals – **Interface 1-8**, **PASS**, and three **FAIL** bins are displayed.
- Counter operates in “**0.1 sec**” or “**0.01 sec**” modes.
- Counter will count up to **1000 seconds** (16 minutes 40 seconds).
- **Results of last test** are ‘**dimmed**’ while next test is running.
- Handler or Prober can be easily connected by plugging into the back of the Bin Box.

Quest Bin Box With Cable



Setup

Getting Started

The **Quest Bin Box** comes ready to use. Simply attach the DB25 cable (supplied with the Bin Box) into the back of the Test System in the **Handler/Prober Port** and the other end into the “**to Tester**” connector on the back of the Bin Box. All the power for the Bin Box is supplied by the +5V from the tester (see external power under “Theory of Operation – stand alone mode” section). Connect the automatic handling equipment (Handler / Prober) into the “**from Handler**” connector on the Bin Box.

Polarity Switch

The **Quest Bin Box** is typically shipped with the **Start Test** signal in the “Active LOW” configuration to match the typical setup in the Test System. However, the **Start Test** signal can easily be changed to an “Active HIGH” configuration with the “**Polarity**” switch.



The Polarity slide switch is easily accessed via a small slot located on the right side of the Bin Box. To change to active LOW or active HIGH, slide the switch to the position as labeled.

The position of the Polarity switch must match the configuration of the START TEST signal inside the Tester. Since there are only two positions, one of them should work.

Examples of the how this signal is configured inside the test systems are show in this manual in the “**Troubleshooting and Tester Interface**” section.

Cables

The **Quest Bin Box** comes standard with a 2-meter (6.54’) length ribbon cable with two male DB25 connectors. This ribbon cable goes from the Bin Box (bottom connector in back) and plugs directly into the Handler/Prober Port on the back of the Test System. Other cable lengths are available from Quest.



The DB25 cable from the Handler or Prober that was plugged into the Test system can now be plugged directly into the back of the Bin Box (top connector in back).

DB-25 Female Connectors on back of Bin Box



Theory of Operation

General Operation

Once connected (see *Setup*), the **Quest Bin Box** will continually monitor and display the results of all testing.

The “**Start Test**” signal is generated by the Bin Box and this signal is sent to the test system. This signal will cause the tester to initiate and execute a test. When the test ends, an “**End of Test**” signal (EOT\) will be created by the tester. This signal will stop the 4-Digit **Test Time Counter** and will update all the displays with the results of the test. The Test Time Counter has a switch next to it that controls the resolution of the count.

The red “**STOP**” button is provided to stop the counter when desired, but does not stop the present test.



If the “**LOOP**” mode switch is enabled, the EOT\ signal from the tester will automatically cause the Bin Box to trigger a new Start Test signal back to the tester and the system will repeatedly execute the same test.

Finally, the **Quest Bin Box** can be disconnected from the tester and can be used in a “**Stand Alone**” mode. With an external +5V supply connected, the Bin Box can be used as a desktop “general purpose” timer. The START button will start the timer and the red **STOP** button will stop it.

Start Test & EOT\

When the **START** button is pressed on the Bin Box, a 14ms wide, negative pulse is generated (see *Polarity Switch* in *Setup*). This pulse becomes the **Start Test** signal and is sent to the test system through Pin 15 of the DB25 “*to Tester*” connector. The yellow “Testing” LED on the Test Switch will also light signifying that a test is in progress.



The Handler or Prober can also initiate this signal. However, unlike the other 24 signals in the DB25 connector, this one signal (**Handler Start Test**) does not go directly between the two DB25 connectors. It enters the Bin Box on Pin 15 of the “*from Handler*” connector and is used internally in the Bin Box. The pulse is passed through and leaves on Pin 15 of the “*to Tester*” connector. The original timing and polarity of Handler Start Test is maintained (unless *polarity* switch is reversed).

When the tester finishes its test, it generates about a 10-12ms wide, negative pulse. This “**End of Test**” signal (EOT1\) is sent from the tester to Pin 5 of the “*to Tester*” DB25 connector on the back of the Bin Box. The signal is wired directly to Pin 5 of the “*from Handler*” DB25 connector and is passed on to the Handler/Prober.

Remote Start Test

The Start Test signal can also be generated directly from the Start Button on the testers’ test deck or from the ‘**T**’ (Test) command entered from the computer keyboard. However, since the Bin Box can see neither of these signals, the counter will not be started. When the test ends, the EOT\ signal will be seen and the Bin Box will display the updated bin information.

4-Digit “Test Time” Counter

The **Test Time** is defined to be from the *trailing edge* of **Start Test (ST\)** to the *leading edge* of **EOT**. The 4-Digit “**Test Time**” Counter also uses these two edges as its counter Start and counter Stop controls (**NOTE:** see ‘*Specifications: Accuracy*’). The Test Time counter is reset to ‘**zeros**’ during the LOW pulse of Start Test and begins counting on its *rising* edge. The ‘running’ count is displayed until the rising edge of EOT\ stops the counter and freezes the display

Pressing the red **STOP** button will also stop the counter. However, although the counter will stop running, the tester will continue to run the test program. The EOT\ signal from the tester will then only update the Binning Displays.



The **slide switch** to the left of the counter allows the counter to display the Test Time in two resolutions, either in *Tenths* of a second or in *Hundreds* of a second (see *Specifications*).

Setting of 0.01 seconds = count up to 100 seconds = 1:40 minutes
 Setting of 0.1 seconds = count up to 1000 seconds = 16:40 minutes



The **red Overflow LED** (located above the red STOP button) will light should the Test Time exceed the upper count limit and the counter will stop its count displaying all **Zeros**. An overflow will not affect the testing process except the Test Time will be lost. Any new Start Test will clear the Overflow LED and reset the system back to normal operation.

NOTE: The counter will only run if the “Start Test” signal was generated by the Bin Box or Handler/Prober. The Tester “TEST” button and monitor “T” command will not start it.

Pass, Fail, Retest and Binning Displays

Along with the EOT\ signal from the tester, there are 11 **Binning signals**. These signals are:

DB25 Connector	Comment
-----	-----
Pin 3 Retest\	- Retest from tester
Pin 4 Openfail\	- Opens Failure
Pin 7 Parfail\	- Parametric Failure
Pin 8 Funfail\	- Functional Failure
Pin 9 Bin 1\	- Interface Bin 1
Pin 10 Bin 2\	- Interface Bin 2
Pin 11 Bin 3\	- Interface Bin 3
Pin 12 Bin 4\	- Interface Bin 4
Pin 13 Bin 5\	- Interface Bin 5
Pin 14 Bin 6\	- Interface Bin 6
Pin 23 Bin 7\	- Interface Bin 7

At the End-of-Test, the Bins that are to be set, will pulse low. As shown in the *Timing Diagrams* Section, the EOT\ signal will latch the binning information and display it on the LEDs and on the 7-segment Bin Display. An absence of any ‘**FAIL**’ signals will produce a “**PASS**” condition.

Dimming: When a new Test is started, the results that were displayed for the last test will be dimmed – includes: Bin # display and ParFail, FunFail, OpenFail, Pass, Retest LEDs.

Loop Mode

The **Quest Bin Box** has a “**LOOP**” mode switch that allows continuous testing to occur. When the present test ends, a new Start Test signal can automatically be initiated and sent back to the tester to repeat the test.



The LOOP Mode is typically used for the following:

- **to have a Test System repeatedly run Self Checks for checkout/burn in.**
- **to run the same test repeatedly on one DUT to see if it fails.**
- **as a debug aid in repairing the Test System.**

To enter the LOOP Mode, slide the Loop Mode slide switch up. The **yellow “LOOP”** LED will be lit anytime the Bin Box is in the Loop Mode. Pressing the **START** button will initiate the 1st test and the Bin Box will now continually start a new test when an **EOT** signal is received signifying the last test has ended. The Loop LED will be out when Loop Mode is exited.

Loop Mode is **exited** by any of the following:

- **Sliding the Loop Mode switch OFF (away from ‘loop’ LED).**
- **Pressing the STOP button (counter will stop and Loop Mode will be exited).**
- **A ‘Start Test’ signal initiated by a Handler or Prober.**
- **If the counter reaches an ‘overflow’ count.**
- **And...the position of the Loop Mode switch is ignored on Power up.**

NOTE: When in LOOP mode, holding down the ‘**START**’ button as the test ends, will stop the “looping” so binning and test times can be checked. Releasing the **START** button will resume looping.

Retest – Handler & Tester

The testers have the ability to do a ‘**Retest**’ of a DUT. That is, they can erase the results of the last test and do a ‘retest’ of the DUT. This is usually done when an OPENs failure is detected. The idea is to have the Handler/Prober release the probes connecting to the DUT and then reconnect to the same device and maybe make a better contact on the 2nd try thus preventing a possible good part from being rejected just because a poor contact was initially made with the DUT.

This is accomplished by the Tester issuing a “**Retest**’ bin signal at the same time as End-of-Test (**EOT**). The handling equipment must have the ability to recognize both of these two signals and have the ability to retest the same DUT.

The Handler/Prober may also have the ability to tell the tester to do a **Retest**. It can send a “Handler Retest” (**HRetest**) signal to the Tester at the same time a Start Test (**STR**) signal is generated. The Tester will then erase the results of the last test and then execute the test program as normal.

The Bin Box will display the fact that either of these ‘Retests’ have been requested by lighting the **yellow Retest** LED located on the right side of the **START** Switch.

Stand Alone Mode

The **Quest Bin Box** has the ability to operate in a 'stand-alone' mode. By connecting an external +5VDC power supply to the Bin Box, it can operate as an independent **START-STOP** counter.

The Counter will start counting when the **START** button is pressed and will stop when the **STOP** button is pressed.

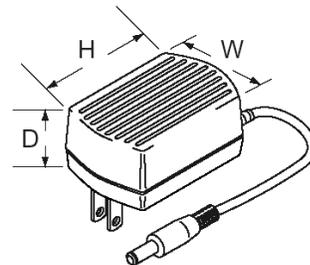
The counter can also be operated electronically by interfacing to the DB25 (*to Tester*) connector on the rear of the Bin Box. Pressing the **START** button will generate a START TEST signal that will come out the DB25 connector on Pin-15. A negative pulse (level) on the DB25 connector Pin-5 will stop the counter (see *Timing Diagrams* for more information).

EXAMPLE: The **Quest Bin Box** was once used as the timer for a Boy Scout "pinewood derby" race. The **START** signal was used to release a gate that started the cars down a ramp. When the 1st car crossed the finish line, a photo diode detected the car and sent a **STOP** signal to the Bin Box and the race time was displayed.

Internal and External Power

The **Quest Bin Box** normally runs off the Test System's +5V power supply. Inside the Test System (Q2, Q8000, & EPRO) the +5Volts passes through a 1N4001 Diode so the actual voltage available to the Bin Box (TV5 signal) is only about +4.3V at about **1 amp** maximum.

An external power supply is required only when the Bin Box is used in stand-alone mode (as when used as a desktop timer or when connected to a system that does not have +5 Volts available). The external power input jack is on the right side of the Bin Box.



An external power supply can also be used while the Bin Box is connected to the Test System to boost the voltage back to +5Volts, but is not needed.

The external power input only accepts:

+5VDC power supply (minimum 2.5Watts) with a 2.1mm plug.

PROTECTION: The Bin Box is protected from incorrect external voltages and polarities. Any excess external voltages will be 'clamped' to about 5.1V through a 3W zener diode and excess current above about 500ma will trip an automatic resettable fuse.

Displays and Controls

Counter Speed Switch: Selects resolution and range of timer, hundreds of a second for 100 seconds (1:40) or tenths of a second for 1000 seconds (16:40).



Test Time Counter: The four-digit display shows the time (in tenths or hundreds of a second) the tester has spent on a test. Counter stops running at End-of-Test.

Overflow LED: Red LED turns on when a test is too long to be timed by the Bin Box.



Stop Push Button: Halts the Test Time display (but does not stop the present test). Will also take Bin Box out of Loop Mode.

Pass LED: Green LED turns on when a DUT passed all tests (i.e. there were no *Fail* Signals). If lit, will appear dim while next test is in progress.

Bin Number Display: Indicates the number of the bin sent to Bin Box for last DUT tested. Last bin number will appear dim while next test is in progress.

Parametric Failure LED: Red LED turns on when a DUT fails a parametric test (*ParFail* signal goes low). If lit, will appear dim while next test is in progress.

Functional Failure LED: Red LED turns on when a DUT fails a functional test (*FunFail* signal goes low). If lit, will appear dim while next test is in progress.

Opens Failure LED: Red LED turns on when a DUT fails an Opens test (*OpenFail* signal goes low). If lit, will appear dim while next test is in progress.

Start Push Button: START button initiates a DUT Test and starts the Test Time counter. Will also interrupt repetition of tests when in Loop Mode by holding down the Start Button.

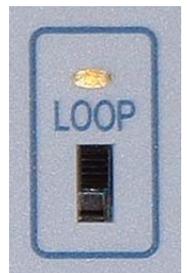


Testing LED: Yellow LED turns on when a test is in progress.

Retest LED: Yellow LED turns on when the tester or the handler issues a *Retest*. If lit, will appear dim while next test is in progress.

Loop Mode LED: Yellow LED indicates the Bin Box is in Loop Mode.

Loop Mode Switch: Switch takes Bin Box in and out of Loop Mode. When selected, tests will be automatically repeated. Loop Mode is exited by either flipping the switch, pressing the Stop Switch, receipt of a Handler Start, or with a Counter overflow. Loop Mode switch will be ignored on Power Up regardless of switch position.



Specifications

Displays

Quest Bin Box Display Chart

Signal	Display	Comment
DATA Bins 1 to 6	7-Segment Display	Bin '7' if available – '0' if no Bins
PASS	Green LED	PASS all Tests
PARA FAIL	Red LED	Parametric Failure
FUNC FAIL	Red LED	Functional Failure
OPEN FAIL	Red LED	Opens Failure
TESTING	Yellow LED	Lit during Testing
RETEST	Yellow LED	Lit if RETEST is requested
LOOP	Yellow LED	Lit if in the "LOOP" mode
Overflow	Red LED	Lit when counter overflows max count
COUNTER	4-Digit Counter	Current & Final Test Times

Timer Settings

4-Digit Counter Setting Chart

Setting	Count Range	Overflows at
0.01 seconds	00.00 seconds to 99.99 seconds	100 seconds = 1:40 minutes
0.1 seconds	000.0 seconds to 999.9 seconds	1000 seconds = 16:40 minutes

If the counter 'overflows', the **Overflow LED** will be lit and the display will show zeros.

Accuracy

Although the counter is quite accurate, the Test Time count may have a variation of about $\pm 20\text{ms}$ or possibly more.

The testers have a uP that is monitoring several inputs and this software variance is random. While the Bin Box counter accurately starts on the **Start Test** signal and stops on the **EOT** signal, the tester may not actually start the test until the uP finally monitors the Start Signal.

Physical Dimensions

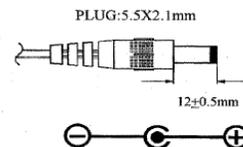
Quest Bin Box dimensions:

$$W=3.75'' \times H=2.125'' \times L=6.625''$$

External Power

The **Quest Bin Box** may be powered externally for "stand alone" mode by plugging in a +5V Power Supply.

Power: +5VDC Supply with 2.1mm plug
 'Hot' center – Ground on outside
 minimum 500ma rating / 2.5 Watt
Plug: Swecraft Model RAPC722



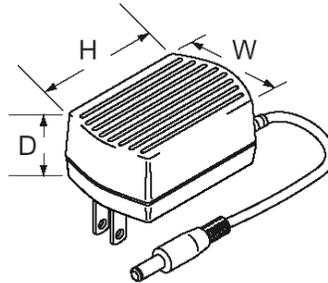
Features

- The **Quest Bin Box** is small and can be located in a convenient location.
- Handler/Prober plugs into back of Bin Box to allow for easy connections. Do not have to go to the rear of the Test System to connect the handler/prober.
- **Displays** the following:
 - **TEST TIME** – displays the test time in ‘*tenths*’ or ‘*hundreds*’ of a second from ‘Start Test’ to ‘End of Test’ signals. Test Time is displayed in **4 digits** up to either 1:40 minutes (99.99 sec) or 16:40 minutes (999.9 sec) – an ‘overflow’ LED lights is counter exceeds count limit.
 - **INTERFACE Bins** – Bins 1 to 6 and ‘special’ Bins 7 & 8 (displays ‘0’ if no bin signals)
 - **PASS LED** and 3 **FAILURE LEDs** – ParFail, FunFail, OpenFail
 - **TESTING LED** – designates a Test is in progress
 - **RETEST LED** – from Tester (Retest) and from Handler (HRetest)
- **Results of last test** are continued to be shown but ‘**dimmed**’ while next test is running.
- **LOOP Mode Switch** – Allows continuous testing to occur. When one test ends a new test is automatically initiated. Used in burn-in, repeated testing of one device, debug
- “**START**” button on Bin Box is used to initiate Testing
- The Bin Box can be removed from the Tester and used as a “general purpose” desktop timer
- Accepts +5V or +12V Signal levels from Handler, active HIGH or LOW
- Can operate in a “Stand Alone” mode using an external +5V power supply.
- Stocked at Quest for Off-the-Shelf Delivery

Options

The following support items for the **Quest Bin Box** can be purchased directly from Quest.

+5VDC Power Module – Wall mount
Quest P/N: **101425**



Replacement 25-Pin D-Sub Cables:

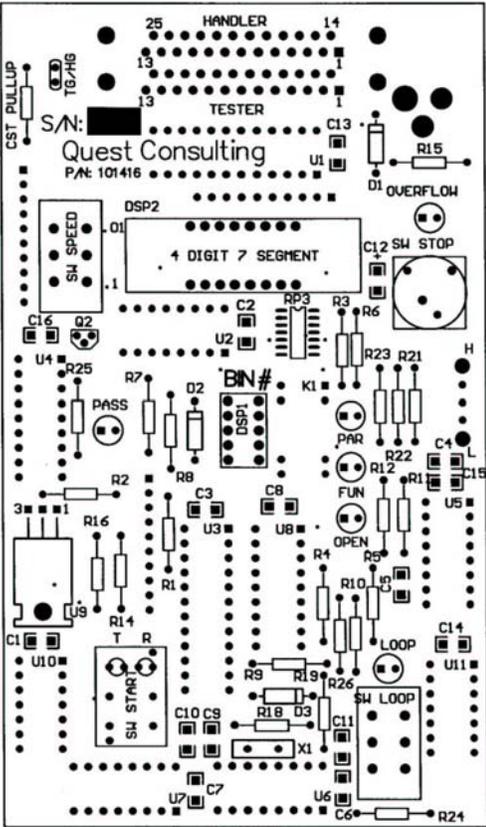
- 2 meter Cable (6.56 feet) – Std.
Quest P/N: **101426-2**

- 3 meter Cable (9.84 feet)
Quest P/N: **101426-3**

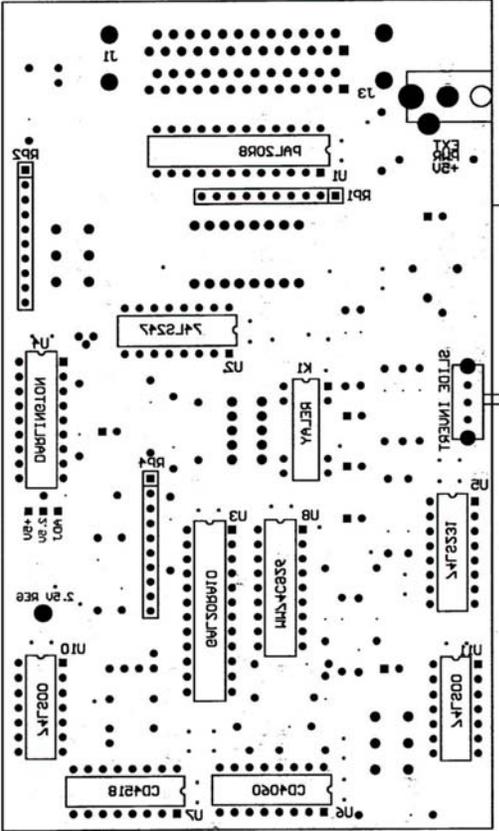
- Custom lengths



Layout Diagrams



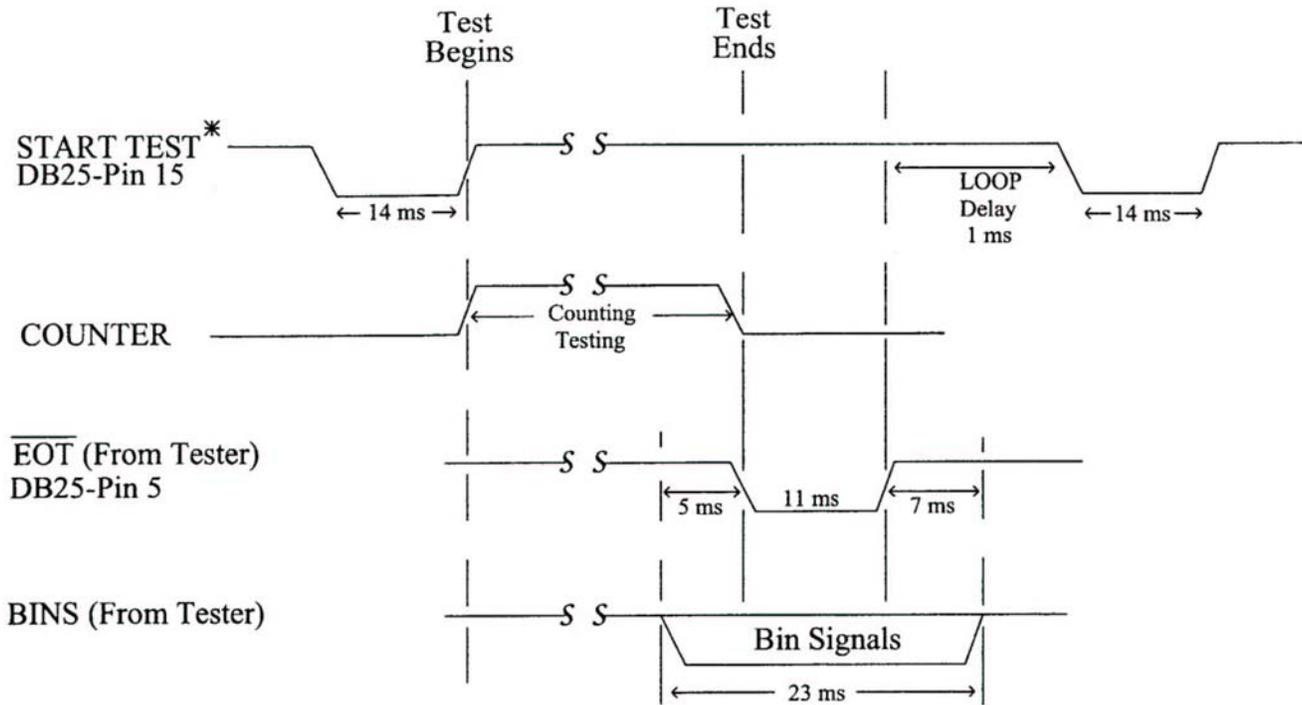
PCB – Top Layout



PCB – Bottom Layout



Timing Diagrams



* The Bin Box "polarity switch" can invert the start test signal from the standard "Active Low" (as shown) to an "Active High" as required by the Test System.

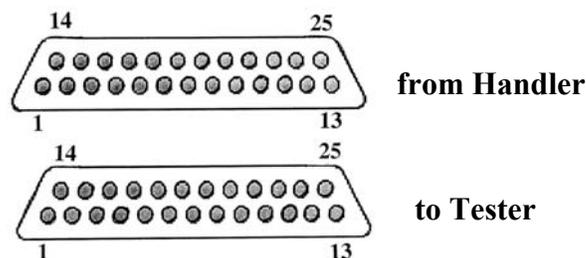
Connector Pinouts

Bin Box Connector Pinout Chart

DB-25 Connectors

Pin	Function	Description	Comments
1	HG	Handler Ground – Referenced to Handler	Pins 1 & 21 (HG/TG) shorted
2	HV (n/c)	Handler Voltage – Referenced to Handler	No Connection in Bin Box
3	Retest\	From Tester – Handler to retest last DUT	Lights RETEST LED
4	OpenFail\	From Tester – LOW=OPEN FAILURE	Lights OPEN Fail LED
5	EOT1\	From Tester - End of Test 1 (Same as EOT2)	Stops Counter – Lights LEDs
6	EOT2\	From Tester – End of Test 2 (Same as EOT1)	Stops Counter – Lights LEDs
7	ParFail\	From Tester – LOW=Parametric FAILURE	Lights PARA Fail LED
8	FunFail\	From Tester – LOW=Functional FAILURE	Lights FUN Fail LED
9	BIN1\	From Tester – LOW=Bin 1 from Tester	Places “1” in Bin Display
10	BIN2\	From Tester – LOW=Bin 2 from Tester	Places “2” in Bin Display
11	BIN3\	From Tester – LOW=Bin 3 from Tester	Places “3” in Bin Display
12	BIN4\	From Tester – LOW=Bin 4 from Tester	Places “4” in Bin Display
13	BIN5\	From Tester – LOW=Bin 5 from Tester	Places “5” in Bin Display
14	BIN6\	From Tester – LOW=Bin 6 from Tester	Places “6” in Bin Display
15	Handler Start Test\	“from Handler” – Upper Bin Box DB25 Conn. Start Test signal from Handler to the Tester	Start Test from Handler Starts Counter – Dims LEDs
15	Bin Box Start Test\	“To Tester” - Lower Bin Box DB25 Conn. Start Test signal from Bin Box to the Tester	Start Test from Bin Box Starts Counter – Dims LEDs
16	CST\	Common - Tester Start Pulled HIGH in Megatest, Grounded in EPRO	Left <u>Open</u> in Bin Box
17	IP1\ (n/c)	Not Used	No Connection in Bin Box
18	IP3\ (n/c)	Not Used	No Connection in Bin Box
19	HRetest\	From Handler – Tester to erase last test results	
20	CRetest\	Common - Retest Signal – Pulled HIGH in Megatest, Grounded in EPRO	Left <u>Open</u> in Bin Box
21	TG	Tester Ground – From Testers Ground line	Pins 1 & 21 (HG/TG) shorted
22	TV5	+5V (4.3V) from Tester – Tester +5 Voltage	Bin Box POWER – 4.3V
23	BIN7\	From Tester – LOW = Bin 7 from Tester	Places “7” in Bin Display
24	BIN8\	From Tester – LOW = Bin 8 from Tester	Not Displayed in Bin Box
25	TV12	+12V (11.3V) from Tester – Tester +12 Voltage	No Connection in Bin Box

DB-25 Female Connectors on back of Bin Box



Troubleshooting and Tester Interface

Should the **Quest Bin Box** not work when connected to the Test System, check the following.

1. If there seems to be **no power** to the Bin Box, verify all cable connections are correct. The interface cable goes from the Bin Boxes “*to Tester*” DB-25 connector to the “Handler/Prober” DB25 Port on the Test System (see **Setup**). If the cables are connected and the Bin Box is still not powered up, the +4.3V may not be coming out of the Tester.

With the Tester powered up and the Bin Box disconnected, check for +4.3Volts on Pin 22 (TV5) of the DB25 connector. The +5V signal is passed through a 1N4001 diode on the Tester’s Interface board (see following chart), which drops the voltage to about +4.3Volts. If this voltage is not present, examine the circuit around the 1N4001 diode on the Interface Board.

Location of components on Test System Interface Board

(last board in the system)

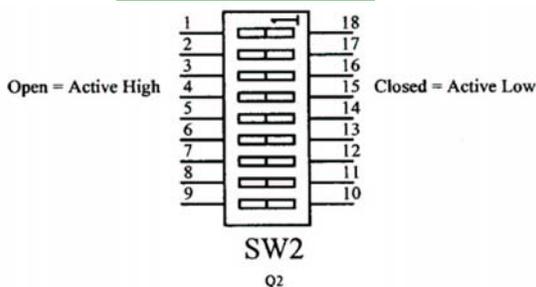
Test System	1N4001 Diode	Polarity Switch & Switch Position	Resistor Header
Megatest Q2/xx	CR3	SW2 – Switch 4	WW7
Megatest Q8000	CR1	S1 – Switch 4	10B
EPRO 142A	CR2	SW2 – Switch 1	X2
EPRO 142AX	CR2	SW3 – Switch 1	X2

2. If the Bin Box is powered up but **does not cause the Tester to execute a test**, check the following:
 - Verify a Test Program is loaded and running.
 - Verify a test can be started from the tester Start button.
 - Verify the Pass/Fail LEDs and Bin# displays are updated at the end of the test.

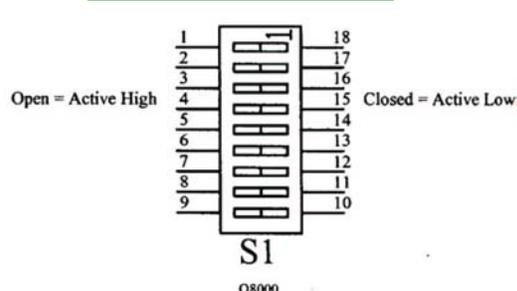
If the above items are working, the problem is possibly with the **polarity** of the START TEST (ST\) signal being sent to the Tester. The Testers have the ability to accept either an **Active HIGH** or **Active LOW** input signal. This is set internally in the Test System with a DIP switch (see chart and polarity switches). This polarity is usually determined to match the output signal polarity of the Handler/Prober. Likewise, once set, the Bin Box must also be set to match this polarity.

The Polarity Switch is located internally on the Bin Box and can be set through a rectangular slot on the right side of the box (see **Setup – Polarity Switch**). This switch will flip the Start Test signal from Active Low to Active High. One of these two settings should correct the problem.

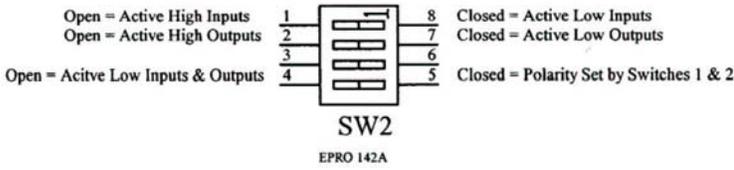
Q2 Polarity Switch



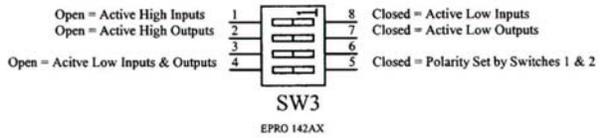
Q8000 Polarity Switch



EPRO 142A Polarity Switch



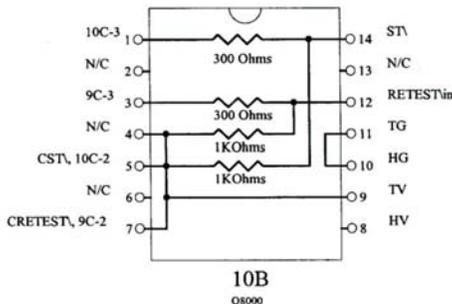
EPRO 142AX Polarity Switch



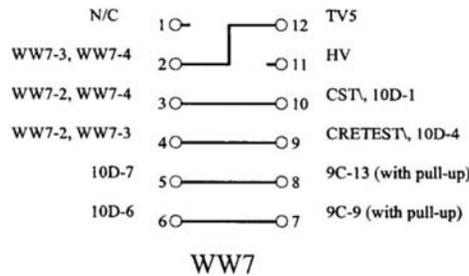
- If the Tester has never been set up to run with automatic handling equipment (Handler/ Prober), the problem may be with the “Input Header” on the Interface board (see chart for Resistor Header locations).

Because there are various interfaces possible, the manufacturers of the Testers have set up ‘headers’ in the START TEST signal path to allow for custom interfaces. Most of these require a series resistor and sometimes a pull-up resistor. See the following diagrams for recommended header configurations.

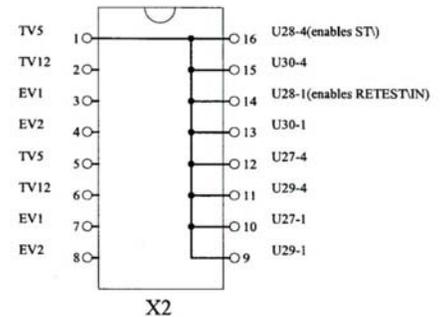
Megatest Q8000 Headers



Megatest Q2/xx Headers

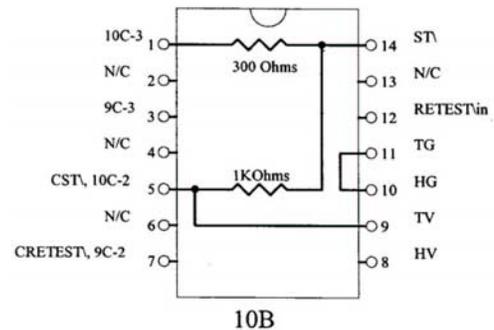


EPRO 142A & 142AX Header



Other Possible Q8000 Headers

Q8000 testers shipped from Quest will have the standard header shown on the right. This header is similar to the recommended header shown above except that the handler RETEST\ signal is not configured.



Some of our customers use an alternate version of the header shown on the right. This header is similar to the recommended header shown above except that this header does not use pull-up resistors. A pull-up resistor is only needed when a pull-up resistor is not already installed on the handler side of the circuit.

