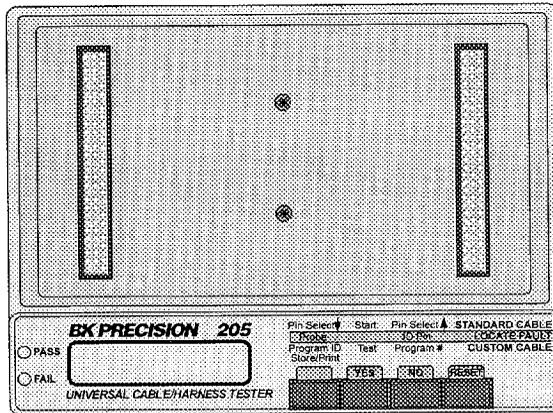


**BK PRECISION®**

## Instruction Manual

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Model 205 Universal Cable Tester

## Limited Three Year Warranty

B+K Precision warrants to the original purchaser that its product and the component parts thereof, will be free from defects in workmanship and materials for a period of three years from the data of purchase.

B+K Precision will, without charge, repair or replace, at its option, defective product or component parts. Returned product must be accompanied by proof of the purchase date in the form a sales receipt.

To obtain warranty coverage in the U.S.A., this product must be registered by completing and mailing the enclosed warranty card to B+K Precision, 1031 Segovia Circle, Placentia, CA 92870 within fifteen (15) days from proof of purchase.

Exclusions: This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alternations or repairs. It is void if the serial number is alternated, defaced or removed.

B+K Precision shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific rights and you may have other rights, which vary from state-to-state.

Model Number: \_\_\_\_\_

Date Purchased: \_\_\_\_\_

**Instruction Manual**

for the

**MODEL 205**

**CABLE / HARNESS**

**TESTER**

by

**B+K Precision**

1031 Segovia Circle  
Placentia, CA 92870-7137  
Phone: (714) 237-9220 Fax: (714) 237-9214

## Model 205

### USER'S MANUAL

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## SECTION ONE: GENERAL INFORMATION

### 1.1 Introduction

The Model 205 is a portable and stand-alone cable / harness tester for cables of up to 128 test points. The 205 detects opens, shorts, and miswires within one second by comparing test results with a golden file or a baseline recording from a sample cable. Upon error detection, an error message can be displayed on the LCD display or printed out on a printer with the correct wire list for reworking.

The tester uses a changeable universal adapter card that allows the user to load up to 22 commonly used connectors and variety pin numbers by connecting and soldering the appropriate mating connectors on the card.

With the adapter card, cables with multiple connectors on one end or cables with differing types of connectors and pin numbers on each end can be tested without the trouble and cost of needing to change modules for each individual type of connector.

Testing and operation of the 205 are made simple through its user-friendly software with easy-to-follow menu prompts.

### 1.2 Features

- Fast open/short test for flat cable or any discrete wire harness up to 128 test points.
- The furnished adapter card ( A-1) fits all the commonly used connectors.
- Provides golden file for all pin to pin cable testing or learns from a known good harness assembly.
- Battery back-up memory stores the wire list for 50 cables.
- Interfaces to parallel printer, prints out the complete wire list or the error messages with the correct wire list for reworking.
- Multiple connections are checked with each single point or other multiple connections.
- A unique hexadecimal signature is assigned for test result assurance and test program identification.
- Test probe is included for wire identification or debugging.
- Stop on error/step through on error displays each error message against the correct wire list.

## 1.3 Unpacking and Inspection

The Model 205 cable/harness tester was carefully tested and inspected both mechanically as well as electrically prior to shipment. Upon receiving the instrument, carefully unpack all items from the shipping cartons and inspect them for any obvious signs of physical damage that may have occurred during delivery. Report any such damage to transit agent immediately. Save both the packing box and foam blocks for future use in case re-shipment is required. After unpacking the tester, check for the following packaged items which are included in the sale.

- One 205 cable/harness tester.
- One adapter card ( A-1 ).
- One test probe.
- One Instruction Manual.
- One AC adapter.

## 1.4 Instrument Identification

Each B+K Precision instrument has a eight-character serial number (e. g. 97120015). The first three digits identifies year of manufacture, the second two digits identify the month, the last four digits refer to the manufactured run quantity.

## 1.5 Accessories and Options

The following accessories are provided with each B+K Precision 205 base unit:

- One single wire test probe with standard banana jack.
- One Operator's Manual.
- One 120 VAC to 14-12 VDC adapter with output current 700 ma.
- One adapter card ( A-1 ) with two 96-pin DIN connectors.

The following accessories are optional:

- Extra adapter card ( A-1 ).
- Male PCB finger for card edge connector.
- Adapter card ( A-2 ) for high density D-Sub connectors.
- Any special customer designed adapter card.

## SECTION TWO: FUNCTIONS

### 2.1 Introduction

All operations of the 205 are accessed via the four push-button key switches on the panel. Each key is multiplexed with two or more functions as described following: (See drawing at end of Section 2.)

### 2.2 **PROGRAM / Pin Select ↓ / Probe / Program ID / Store / Print Key**

- Functions: - Selects (counts down from 64) number of pins for a standard cable.
- Retrieves the first stored program and places cable tester in Custom Cable mode.
  - Remembers custom cable in LEARN mode.
  - Selects PROBE for fault location.
  - PRINTS wire list stored in memory.

### 2.3 **START TEST / Yes Key**

- Functions: - Begins test procedure after required test conditions are selected.
- Affirmative response to tester queries.

### 2.4 **Pin Select ↑ / ID Pin / Program # / No Key**

- Functions: - Selects (counts up from 2) number of pins for a standard cable.
- Selects Custom Cable PROGRAM # stored in memory.
  - Displays pin numbers for fault location of failed cable.
  - Negative response to tester queries.

### 2.5 **Reset Key**

This key is operated as a hardware reset key. When the key is pressed, it will set the tester to its original power up stage with all conditions cleared to default values. It can also be used to clear the system RAM memory when held down together with the **PROGRAM/PROBE** key and released first. The clear command will erase all of the program files that were stored in the CMOS battery back-up RAM.

### 2.6 **Display and Indicator**

#### 2.6.1 **LCD Display**

The display is a 2x16 LCD display used to show user prompts, test messages, test results, and other operating information.

## **2.6.2 Pass/Fail LED Indicator**

The PASS and FAIL indicators are located on the left side of the LCD. At the end of the test, the test result information will be displayed on the LCD and the appropriate LED will be lit to indicate either a PASS or FAIL status of the test.

## **2.7 DC Power Jack**

A 2 mm male power Jack for DC power input is located on the back panel of the 205. Its mating connector is a female plug with a 2.1 mm diameter. The negative voltage is in the center and the positive voltage is on the sleeve.

## **2.8 Power On/Off switch**

The power ON/OFF switch is on the back panel near the side of the DC power jack. The power switch turns the unit on and off and is also used to clear battery back-up memory files. When the power switch is operated while the PROGRAM/PROBE key is depressed, the user will erase all files in the battery back-up memory.

## **2.9 Printer Interface**

A 25 pin D-sub female connector is located on the back panel. The connector provides a parallel interface port for the standard Centronics type printer.

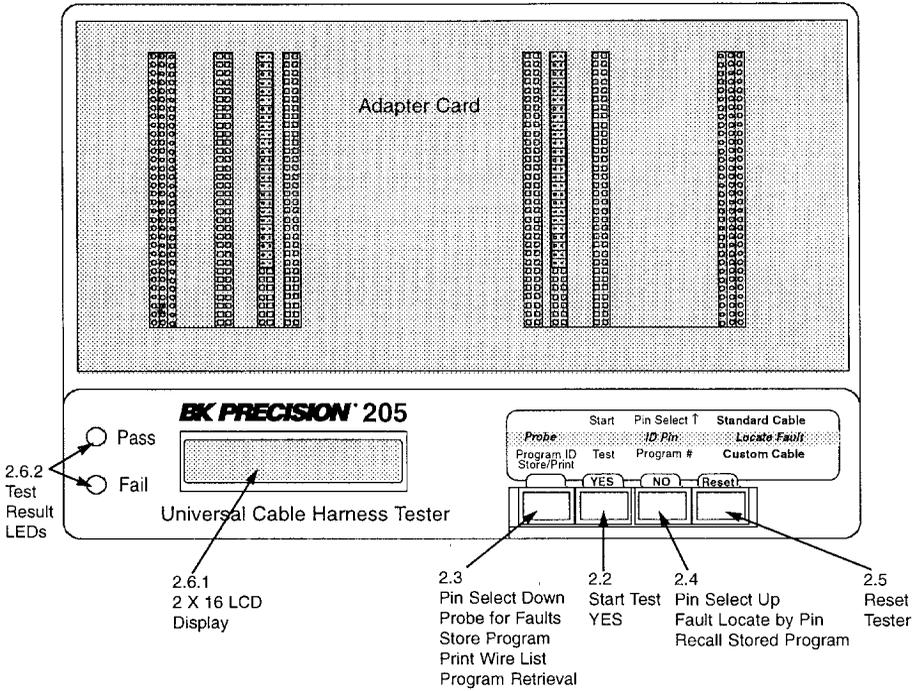
## **2.10 Adapter Card Interface**

Two 96-pin female DIN connectors are mounted on the front panel with 64 channel drivers on the right side connector and 64 receivers on the left side connector.

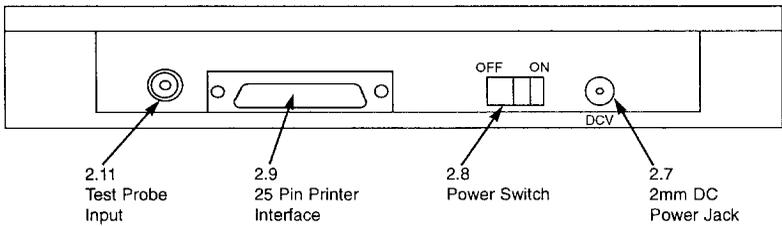
## **2.11 Test Probe Input**

A standard .175" banana socket is mounted on the back panel of the tester for the input of the test probe.

## TOP VIEW



## REAR VIEW



## SECTION THREE: OPERATION

### 3.1 Theory of Operation

The 205 is a microprocessor based instrument which can test any cable or wire harness with a max. test point of 128. The tester performs a self diagnostics test as soon as the power is turned ON. During the self-diagnostic test, the 205 checks the internal address and data bus, control logic, memory, and turns on the beeper alarm and the LED indicators for 0.5 sec. Should it fail in the self-test, the beeper is either constantly turned on or off to indicate the failure of the tester.

The 205 is designed with a 64 test pattern driver on the transmit side and a 64 receiver on the receiving side. During the test, a unique test pattern is transmitted from each driver. As the test patterns are recorded on the receiving end, the data is compared with a golden file for pin to pin IDC flat cable or with data learned from a known good wire harness sample.

If both data are the same, the test has passed. Otherwise, the test has failed. From the difference, a simple open or short can be easily detected and displayed. With the extensive software analysis ability of the 205, errors of the multiple connections with each single point or other multiple connections are also detected and pin-pointed.

A probing function allows the user to identify each wire with the connection as the test probe touches the test point. When this function is employed, the 205 generates a walking zero test pattern continuously on the driver side. Meanwhile, the receiver picks up the signal where the probe is touched and with each corresponding timing of the driver that generated this signal, the test point under probed can be defined.

The 205 allows the user to easily program and store up to 50 different wire lists of any cable and each program is assigned with a unique signature for program identification. The 6 digit hexadecimal signature is derived by mathematical operation from the data of the wire list that stored in the program. If a single bit of the data is changed, it causes a significant change to the overall signature.

### 3.2 Test the IDC flat Cable

All the IDC flat cables are pin to pin sequential connected on both end of the connectors. The connector on each end of the cable can be different in style. For example, a ribbon flat cable may have a D-Sub connector on one side and a card edge connector on the other.

The following are the test procedures and precautions in testing the IDC flat cable:

- 1) Load and solder the appropriate mating connectors on the adapter card. Make sure the connectors are loaded from the pin #1 on each circuit layout of the adapter card, one connector on side A and the other connector on side B.
- 2) Connect the cable to the mating connectors on the adapter card. No polarization is required. Proper set-up depends on which side the mating connector is loaded. Be sure only one cable can be loaded at a time.

3) As display shows:

IDC FLAT CABLE  
TEST YES/NO?

Press the YES function key then display shows

2 PIN FLAT CABLE TEST  
YES/NO?

Select the maximum cable pin number by pressing PIN SELECT ↑ to increase and PIN SELECT ↓ key to decrease the pin number.

This number must be properly selected or the cable cannot be tested completely or failed for tests on pins that are greater than the max. pin of the cable.

4) After the max. pin number of the cable is selected, press the START TEST key. The display shows:

TEST IN PROCESS

If the cable passes in the test, the display shows:

TEST PASSED

With the "PASS" green LED is lit.

If the cable fails in the test, the display shows the first defective pin No. on side A with both correct and incorrect wire lists. Press the ID PIN key. The tester will jump to the second defective point and generate an error message. The ID PIN key will step through all detected defects until all the failures are stepped through.

### 3.3 Learn Mode and Program Generation in Cable / Harness Testing

The 205 can test any kind of cable with its powerful learn mode. Even the IDC flat cable can be tested since this kind of cable are connected pin to pin. The tester provides the golden file for the standard reference to compare, allowing the learning process in most of the IDC flat cable testing to be omitted. However, some of the IDC flat cable with the following conditions must still use the learn mode to test:

- 1) The IDC flat cable has no connection pin on one end or both end of the connectors.
- 2) The pin No. 1 of the IDC flat cable can't match up, after it is connected on the adapter card due to the orientation of the mating connectors.
- 3) The pin to pin connected cable, with multiple connections on one end or both ends.

The random wire harness cable and the IDC flat cable with the above conditions should use the learn mode to test.

Before applying the learn mode, a known good cable sample is required. After the sample cable is connected on the adapter card and the display shows:

```
IDC Flat Cable
Test          Yes/No?
```

Press the NO key. The display will then show:

```
Ready to Learn
Yes/No?
```

Press the YES key. The wire list of the sample cable is read into the tester and then the display shows:

```
Learn is done.
Store or start?
```

If the user wants to save the wire list of this sample cable for future testing, press the PROGRAM ID key to store the data into the CMOS battery back-up memory. A program number will be assigned to this file and the data of the wire list will be compressed into a six-digit hexadecimal code. This signature will be the I. D. code of the cable or the test program. Since this signature is unique to each wire list, if a previously stored program has the same signature with the newly recorded sample cable, the B+K Precision 205 will not duplicate an existing program and no data will be saved.

After a program is successfully stored in the memory, the display will show:

```
Program #N
Signature XXXXXXX
```

Press the START TEST key. The cable should pass the test and the display shows:

```
Test Passed.
Signature XXXXXXX
```

The "PASS" green LED is lit.

Note: There is no signature assigned for the IDC flat cable testing. A signature is generated only in the learn mode process.

### 3.4 Wire List and Error Message Printing

The 205 interfaces to the standard Centronics type printer. It can print out the entire wire list of a cable harness or only the error messages for rework instruction. To have the 205 print out the complete wire list of a cable, it must be learned by the tester and stored in memory under a program file.

As a new program is just stored or a program is retrieved from the tester, the display shows:

Program #N Signature XXXXXXX
---------------------------------

At this time, press **PRINT** key. If there is a printer on line, the whole wire list of this cable will be printed out. Otherwise, the display shows:

No Printer
------------

The following is a sample of the wire list which is printed out from the tester.

\*\*\*\*\* **B+K PRECISION 205 CABLE TESTER DOCUMENTATION** \*\*\*\*\*

USER: \_\_\_\_\_  
CABLE ASSEMBLY NUMBER: \_\_\_\_\_  
CABLE DESCRIPTION: \_\_\_\_\_  
SIDE A CONNECTOR TYPE: \_\_\_\_\_  
SIDE B CONNECTOR TYPE: \_\_\_\_\_  
DATE: \_\_\_\_\_

TEST PROGRAM NUMBER: 9

CABLE SIGNATURE: 3F502B

WIRE LIST:

SIDE A	SIDE B
1 _____	> 5, 6, 15
2 _____	> 8
6 _____	> 23, 25
7 _____	> 19
10 _____	> 1
11 _____	> 2, 4
13 _____	> 14
14 _____	> 14
16 _____	> 7, 9
20 _____	> 20
21 _____	> 5, 6, 15
22 _____	> 5, 6, 15
23 _____	> 30, 31, 32
26 _____	> 22
27 _____	> 23, 25
30 _____	> 33
31 _____	> 29
32 _____	> 11
33 _____	> 29

As a failure is detected during the test, if a printer is on line, all the failed test points with the correct and incorrect wire list will be printed out automatically. If there is no printer present, then all the error messages will be displayed on the LCD display one by one with each push of the **ID PIN** key.

## 3.5 Error Messages and Rework Instruction

As the cable failed in the test, all the error messages can be printed out by the printer instantly if the printer is on line. Otherwise, each error message will be displayed by the LCD display one by one with each push of the **ID PIN** key. Each error message always includes two sets of information, the correct connection (indicated by a "O" sign) which is transferred from the golden file or the reference data in the memory and the incorrect connection (indicated by an "X" sign) which is the current problem spot of the cable under testing.

From the correct and incorrect connection of each error message, the user can find the opens, shorts, or miswire information. The following are some examples of error messages.

### 1) The open wire:

O: 23/A ———→ 46/B  
 X: 23/A ———→ OPEN

This message indicates the connection from the connector pin 23 (on side A) to connector pin 46 (on side B) is open.

### 2) The short wire

O: 21/A ———→ 21/B  
 X: 21/A ———→ 23/B  
 O: 23/A ———→ 23/B  
 X: 23/A ———→ 21/B

The information indicates there is a short between the two connections. Pin 21 and pin 23 on both side A and side B are shorted together.

O: 3/A ———→ 12/B  
 X: 3/A ———→ 26/B

This message indicates there is a extra connection from connector pin 3 on side A and connector pin 12 on side B short to connector pin 26 on side B.

### 3) The miswire:

O: 3/A ———→ 12/B  
 X: 3/A ———→ OPEN

O: 3/A ———→ 12/B  
 X: 3/A ———→ 26/B

This set of message indicates the connection from connector pin 3 on side A to connector pin 12 on side B is miswired to the connector pin 26 on side B.

O: 3/A ———→ 16/B  
 X: 3/A ———→ OPEN

O: 3/A —————> 11/B\*  
 X: 3/A —————> 20/B

This set of messages indicates the connection from connector pin 3 on side A to connector pin 16 on side B is miswired to connector pin 20 on side B. The \* sign on 11/B\* indicates the connector pin 11 on side B is a multiple connection to several other points. Pin 16 is one of the points, but it miswires to pin 20 instead of pin 16.

### 3.6 Retrieve a Previous Stored Program for Testing

A cable or wire harness program, once learned by the 205, can be stored in memory for several years. The wire list is assigned a program number and a signature code for retrieval from the tester.

When the display shows:

IDC Flat Cable Test Yes/No?
--------------------------------

Press the PROGRAM ID key if there is a program stored in memory. The display will show the first program with its signature. Press the PROGRAM # key to scroll the programs and the signatures until the desired program number is found. To start the test, press the START TEST key. To print the complete wire list of the program to a printer on-line, press the PRINT key.

### 3.7 Erase the Whole Memory Content

The 205 allows the user to store up to 50 different wire lists. Since all wire lists and signatures are unique, there no duplicate storage is allowed to save memory space.

If there is a need to erase all the files in the memory, depress and hold the PROGRAM ID key while turning the unit on or press the PROGRAM ID key and RESET key together and release the RESET key first. All programs stored in memory will be erased. To verify erasure, press the PROGRAM ID key. If the 205's memory has been successfully erased, no program can be retrieved.

### 3.8 Test Points Identification with the Test Probe

The 205 provides the function of identifying individual test points with the connection in contact with a test probe. When this function is activated, the tester sends out a continuous test pattern from the driver output on side A of the adapter card. This signal can be captured on the test points of both side A and side B. If there is a connection, the wire list will be displayed. If there is no connection between side A and side B, only the test points on side A can be identified.

At any time after the START TEST key is pressed and the test begins, if the PROBE key is pressed, regardless of pass or fail status, the display will show:

Test Point I.D. Probing
----------------------------

Connect the test probe to the banana socket on the back panel of the tester. As the probe is touched the test point, the connection of this point will be displayed. If the test point touched is a multiple connection point, the display will scroll each pin number which is connected to this point both on side A and side B.

## SECTION FOUR: CONNECTOR ADAPTER CARD

### 4.1 Introduction

The 205 connector adapter card is a changeable printed circuit board that is plugged into the tester with two 96 pin DIN connectors. The connector on the left hand side (JR1 - JR3) is for 64 receiver inputs and the connector on the right hand side (JT1 - JT3) is for 64 driver outputs. The left portion of the card is called "SIDE B". All connectors on this side are pin to pin tied together and connected to the receiver inputs. The right portion of the card is called "SIDE A". All connectors on this side are pin to pin connected to the driver outputs.

The adapter card (A-1) is designed to fit most of the commonly used connectors. The user has to load and solder the appropriate mating connectors for the cable to be tested. The card can load up to 22 mating connectors with the following PCB layout patterns.

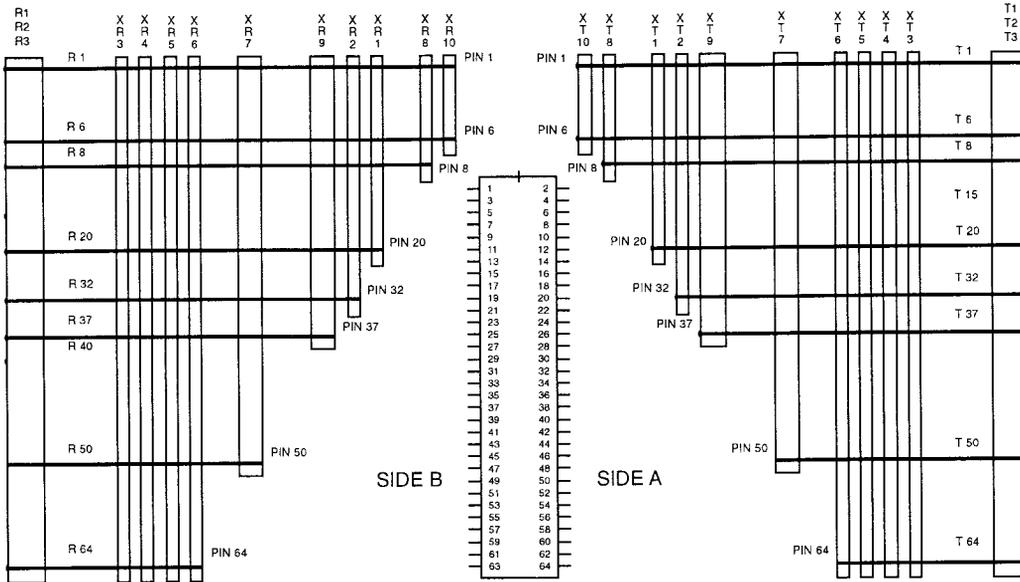
- 1) Eight 0.1" spacing dual row connectors with 64 pin max.
- 2) Two "D" - subminiature dual row connectors with 37 pin max.
- 3) Two delta (centronics) type connectors with 50 pin max.
- 4) Two 0.6" DIP connectors with 40 pin max.
- 5) Two RJ 11 phone plug with 6 pin max.
- 6) Two RJ 45 phone plug with 8 pin max.
- 7) Two 0.156" spacing single row header with 20 pin max.
- 8) Two 0.1" spacing single row header with 32 pin max.

The cable with any of the above connectors can be tested on this adapter card. The connectors on both ends of the cable can be different in style and pin number or even have a multiple connectors on one end. For proper testing, connect the cable under test with one end on side A and the other end on side B. This will form the connection from the driver outputs to the receiver inputs and each point on the driver side can connect to any point of the 64 receiver inputs.

In order to keep tracking the wire sequence of the tester and the cable under testing, the pin No. display on the tester must be coincided with the pin No. on the mating connectors. In the circuit layout on side A, each pin of the driver output is connected to the pins of the mating connectors as long as their pin numbers match. The receiver inputs on side B has the same structure as on side A. Unless the cable has multiple connectors on one end, the mating connector usually must be loaded from the pin No. 1 of each layout on the adapter card.

WIRING DIAGRAM OF THE ADAPTER CARD

4.2 The Pin Assignment and Wiring Diagram of the Connectors on the Adapter Card



4-2

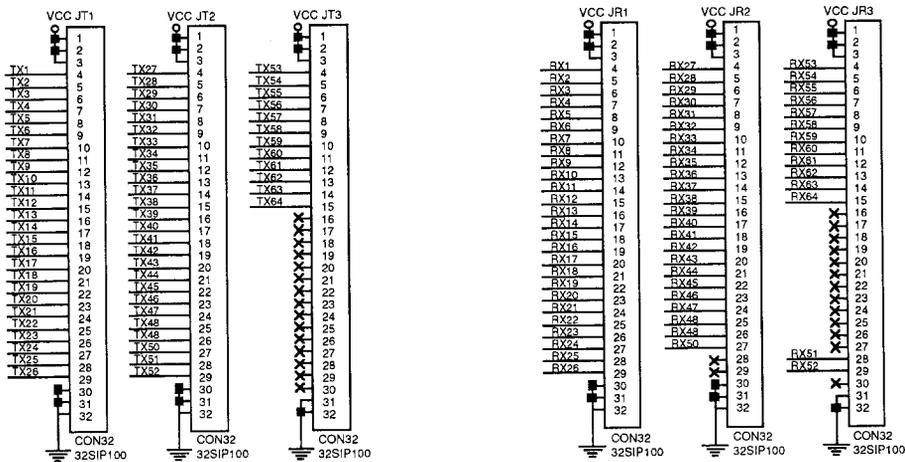
Note 1: All pins are connected in parallel up to the maximum pin count.

Note 2 Side B has the same structure as Side A.

Note 3 The counting sequence of the pin on each connector from XT and XR, 1 thru 10 are shown on the pin arrangement diagram.

ADAPTER PIN ARRANGEMENT

4.3 The Pin Assignment of the 96 pin DIN Connector on the Adapter Card



4-3

#### **4.4 How to Load the Mating Connectors on the Adapter Card**

The pin No.1 of each connector layout on the adapter card is clearly marked. In order to match the wire counting sequence of the tester and the cable under test, the mating connector must be loaded from the pin No.1 of each layout on the adapter card.

For a multiple connectors cable, pin numbers of each connector loaded must be carefully counted to ensure that there is no overlap between any pin of the connectors. For example, a ribbon cable has a 50 pin IDC socket connector on one end and two connectors on the other, a 34 pin card edge connector occupying pin 1 to pin 34 and a 16 pin plug connector occupying pin 35 to pin 50. Consequently, the loading of the mating card finger plug must start from pin 1 to pin 34 and the socket connector must load from pin 35 to pin 50 on the adapter card.

#### **4.5 Test Cable without Using the Connector Adapter Card**

To test cables with mating connectors that cannot be loaded on the adapter card due to its layout or another reason, the test may be applied without using the adapter card.

With two 96 pin male DIN connectors plug into the interface connectors on the tester, follow the pin assignment diagram of the interface connector in section 4.3 and connect each wire to the mating connectors according to the counting sequence of the driver output and receiver input. i.e. If the TX1 on the driver side connects to the pin 1 of the mating connector then the RX1 on the receiver side must connect to the pin 1 of the connector on the other end of this cable. This procedure makes the pin No. display of the tester coincide with the pin No. on the mating connectors.

## SECTION FIVE: SPECIFICATIONS

### Connection Test Threshold:

- 1) Resistance: Shorts < 130 ohm +/- 10%, Opens > 130 ohm +/- 10%.
- 2) Capacitance: Shorts > 0.6  $\mu$ f +/- 10%, Opens < 0.6  $\mu$ f +/- 10%.

### Test Condition:

5 volts at 6 ma.

### Max. Multiple Connections Display:

Up to 16 test points.

### Test Cycle Time:

Less than one second.

### Test point Capacity:

Max 128 points ( 64 connections ).

### Program Storage:

Lithium battery backs up memory for 50 cables.

### Probe:

Single wire test probe with standard .175" banana jack.

### Display:

2 line x 16 character LCD and 2 LEDs for " PASS" or "FAIL" indication.

### Printer Port:

Standard Centronics type parallel interface.

### Power:

DC 12V - 14V, 700ma AC adapter, with negative center plug.

### Dimensions & weight:

2.1" High x 9.1" Wide x 6.2" Deep, 3 lbs (1.36 kg ).

## Service Information

**Warranty Service:** Please return the product in the original packaging with proof of purchase to the below address. Clearly state in writing the performance problem and return any leads, connectors and accessories that you are using with the device.

**Non-Warranty Service:** Please return the product in the original packaging to the below address. Clearly state in writing the performance problem and return any leads, connectors and accessories that you are using with the device. Customers not on open account must include payment in the form of a money order or credit card. For the most current repair charges contact the factory before shipping the product.

Return all merchandise to B+K Precision with pre-paid shipping. The flat-rate repair charge includes return shipping to locations in North America. For overnight shipments and non-North America shipping fees contact B+K Precision.

B+K Precision  
1031 Segovia Circle  
Placentia, CA 92870  
Phone: 714-237-9220  
Facsimile: 714-237-9214

Include with the instrument your complete return shipping address, contact name, phone number and description of problem.

**BK PRECISION®**

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