635-DPI Test Procedure (*20-0235-10)*

Factory Test Procedure

UPDATE DOCUMENT BEFORE RUNNING TESTS …

IMPORTANT: Every time the flash version changes, **Step-1a** in this procedure must be updated, reprinted, laminated and replaced in all the binder sets used by manufacturing.

The information on printer setup is on the inside cover.

INSTRUCTIONS TO UPDATE THE FLASH & REPLACE PAGE

Do the following steps to update the document:

1. **Open the document file in MS Word**
2. Open the **DOCUMENT PROPERTIES** for editing
3. In the **Category field,** update the flash version (**no dot** - e.g. 477)
4. In the **Keywords field,** update the flash version (**with dot**- e.g. 4.77)
5. Click **OK** to save properties.
6. Go to Section-1 Part A (p. 3): **place cursor in the flash field** & **press F9 key**; the version field should update to the correct version.
7. On same line, **place cursor on the file name version and press F9 key** to update the file name version number.
8. **Press <Ctrl + S>** to save the entire file.
9. **Press <Ctrl+P> to open the print properties:**
   - » set **Printer** = 'EXCELSIOR\Copier'
   - » set **Page Range = '3 - 4'**
   - » set number of **Copies** = '3'
   - » click the PROPERTIES button
   - » set **Duplex** = "Open to the Left"
   - » set **Color** = "color" (IF DESIRED)
   - » *make sure staple is 'off'*
   - » click **OK** to send to printer
10. **Laminate the pages and punch holes**
11. **Replace the page in all the binders (1 & 2 factory manager copies)**

IMPORTANT: If steps/ instructions are changed or updated, the document revision should be incremented *(revision number is found in the in the Comments field of the Properties screen)**.***

- *Do NOT increment the revision number when updating the flash code version– the flash version is expected to change.*
- *Increment the revision number to the **left of the decimal** (i.e. change 4.0 to 5.0) if an instruction, test or diagram is changed, added or removed.*
- *Increment the number to the **right of the decimal** (i.e. change 4.0 to 4.1) If a correcting a typo/spelling error –OR- a modification to existing text or diagram is made to clarify the existing instruction.*
- *After changing the revision number, open the header on page1 and update the field by pressing the F9 key when the cursor is on the rev number field.*

SECTION -1: SET UP OF FACTORY TEST ENVIRONMENT

PURPOSE: This section designates the correct flash, prepares the test environment / loads flash to the factory test station.

STEP 1. TEST MATERIALS & REQUIREMENTS

PART	INSTRUCTION

A **This test must use current flash version 5.04 (DPI635_504_release.s28)**

<< This step must be updated when the *flash version* and *file name* changes >>

B **List of Materials:**

TEST BENCH

1) **Test PC:** *with* ***HyperTerminal*** *and* ***IE Explorer*** *installed*

2) **Factory Test Bench/Station:** *loaded with correct Flash*– according to **Step-1A**.

3) **Cable set:**

- » RS-232 Serial cable,
- » 14-pin ribbon cable,
- » 16-pin I2C ribbon cable,

4) **Factory 635 Test Jig:** including the **DPI Loopback Wiring** *and* 12 VDC power supplied

5) **Factory-designated 635 CPU board:** *needed for I2C Data Bus validation*

OTHER ITEMS

6) **Serial Number Stickers**

7) **QC Stamp**

8) **CE Stickers**

9) **Factory-designated Baseline DPI:** marked/flagged used for visual inspection

<< advance to Part C of the setup >>

C Setting up the Factory Test station:

1) **connect the RS-232 Serial Cable** to front of Factory Test Station (bench/controller)
2) **power-up Factory Test Station** (or controller)
3) open **HyperTerminal** session using the following connection settings
   a. ***Baud*** = *57600;*
   b. ***Bits*** = *8;* ***Stop Bit*** = *1;*
   c. ***Parity*** = *None; and* ***Flow Control*** = *None*
4) Type the following commands into the HyperTerminal window:
   » press **<enter>**
   » type **'select'** and **<enter>** *(the select command returns a menu list of boards)*
   » type **'10'** and **<enter>** *- to choose 635 DPI test environment*

LOADING FLASH INTO FACTORY TEST STATION

5) type "**load**" and **press <Enter>** key (Note: a countdown will begin "CCC…")
6) select ***Transfer > Send File*** from the HyperTerminal menu
7) click **[Browse]** button
8) click **[My Computer]** button
9) **navigate to C: > Factory Test > S28 files > 635 > 635 DPI > DPI635_nnn_release.s28**
   (where 'n' represents the correct flash version being loaded, according to **Step-1A**)
10) click **[Open]** button
11) choose **'1K XMODEM'**
12) Click **[Send]** button - to begin the transfer of flash code to the Factory Test Station.

NOTE: if HyperTerminal times out 'CCC…' before the transfer begins, simply repeat steps 6 thru 12.
The file transfer should start on the second attempt, because you are now pointed to the correct folder location and won't loose time browsing.

NOTE: Part C must be done when …
- the flash version initially changes

The memory sector that stores flash code for the ***daughter boards*** *does not get overwritten when you load flash for testing 600-series daughter boards.*

SECTION-2: VISUAL INSPECTIONS

PURPOSE: This describes the inspections done when comparing the target DPI to the baseline DPI.

STEP 2. VISUAL INSPECTION OF TARGET BOARD

PASS ACTION: if the board passes ALL checks, advance to next Step.

FAIL ACTION: if a board fails ANY checks, take the appropriate actions to repair the board before proceeding with Factory Tests.

WARNING: Do not apply power to a failed board until the repairs are done!

PART	INSTRUCTION

A. ORIENTATION OF COMPONENTS:

Perform the visual inspection by comparing the ***target DPI*** to the ***baseline DPI***.

✓ **VERIFY: all 'marked' components are correctly oriented on the *target DPI***

✓ **VERIFY: all the wet-lock jumpers are on the board but not in the 'IN' position**

✓ **VERIFY: the supervision resistors are installed**

B. INSPECTION OF BOARD AND SOLDER:

(*Inspect the front and back of the board*)

✓ **VERIFY: there are no obvious solder bridges** or **cold solder connections**

✓ **VERIFY: there is no obvious damage to the board**

✓ **VERIFY: that parts are not broken, pulled-up, or improperly installed**

SECTION-3: FACTORY TEST & PROGRAMMING

PURPOSE: This section covers the following:

- executes manual & automated tests on the DPI
- loads flash and programs factory default settings on the DPI

STIPULATIONS

- STEP-1 (Setup) MUST be completed before running step-3
- STEP-2 (visual inspection) MUST be completed before running step-3
- ALL instructions and tests MUST be performed in sequential order
- DO not abbreviate, modify or skip any steps
- DO NOT interrupt power to the board during testing
- a failed board must be retested starting from Step-2 after it has been corrected/repaired

STEP 3. SET-UP the FACTORY TEST JIG:

PART	INSTRUCTION
A	**Connect the Test Jig to the Factory Bench:** 1. **TURN POWER OFF ON THE BENCH** 2. **connect power wires** (observing polarity) to the Red & Black lugs on front of bench.
B	**Install the 'designated test CPU' into Test Jig:** 1. Seat the **'designated CPU'** on the left side of Jig*:* align pins ~ OR ~ use +12vdc cable 2. connect the ***16-pin I2C Ribbon Cable*** **to J8** (this will be used later) 3. secure the hasp *as appropriate*

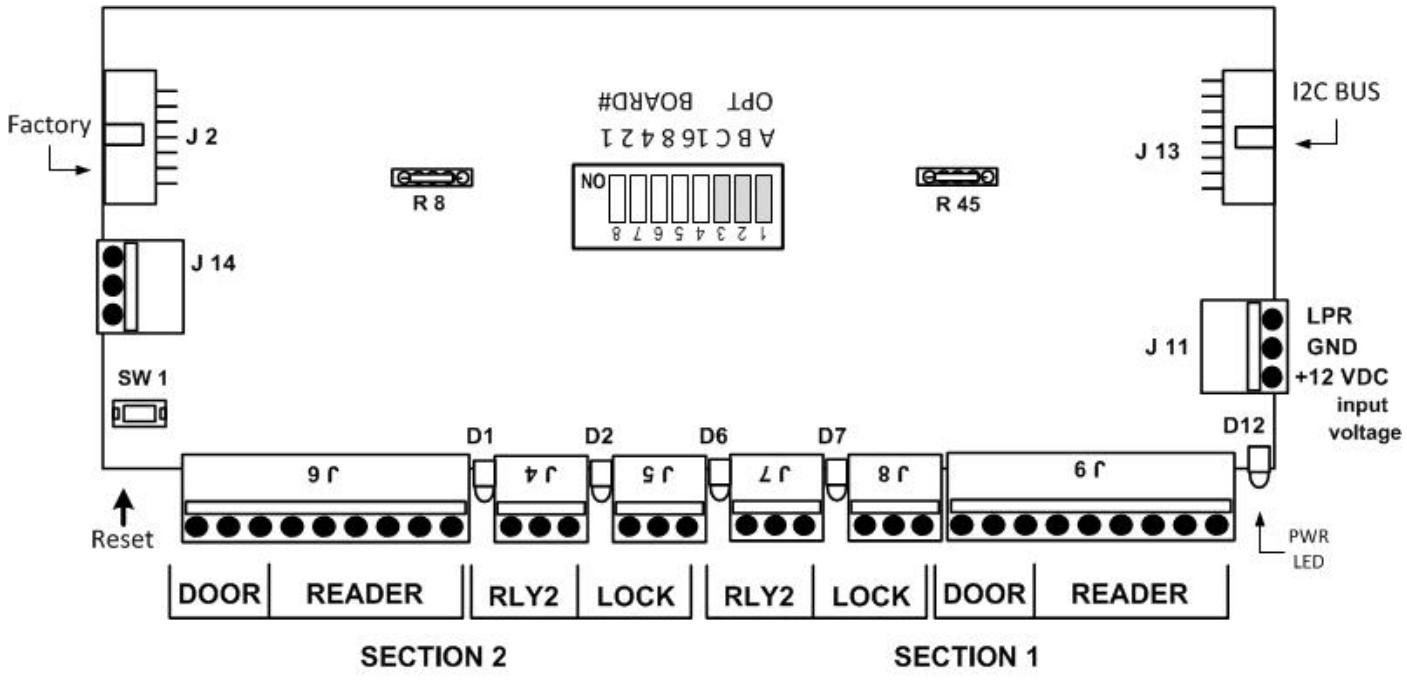
STEP-3 continued …

C **Install the 'target DPI' into RIGHT SIDE of the Test Jig:**

1. Installing the ***loopback harness*** is replaced with the loopback wiring directly on the test jig**. Harness is not used if wiring is present on the underpins of the jig.**
2. Seat the **target DPI** - on the right side of Jig, - align pins or 12vdc cable.
3. Secure the **lock-bar & safety hasp**
4. Connect the ***14-pin Factory Ribbon Cable*** to the **target DPI (J2)**
5. Connect ***RS-232 Cable*** to **Factory Test Bench**

Reference Diagram: Use this diagram to help locate the connections.

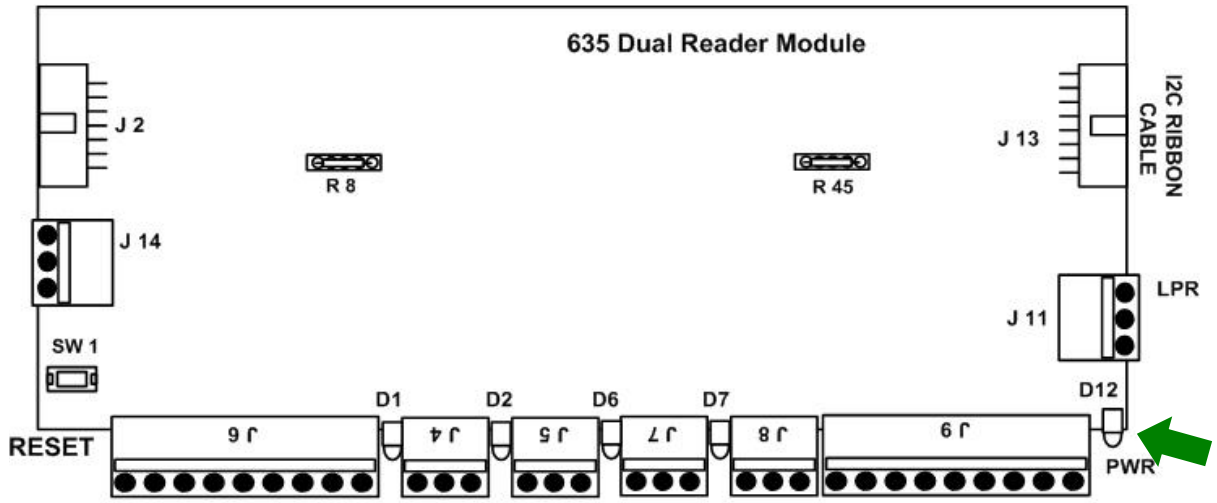
The board should be oriented in this same position when placed on the Test Jig.



STEP 4. TEST BOARD POWER:

A **Turn ON Power to the Test Bench** *at* the toggle switch.

✓**VERIFY:** **the Power LED (D12) is ON/solid.**



STEP 5. RUN THE DPI BOARD TEST:

A **SET UP FOR BOARD TEST AS FOLLOWS:**

- the Factory ***14-pin Ribbon Cable*** should be connected to the **DPI**
- the ***RS-232 Serial Cable*** should be connected to **Bench**
- **HyperTerminal should be open**: *Com Port settings should use: 57600Baud; 8-Bits; No Parity; 1-Stop Bit; No Flow Control*
- **Caps Locks should be OFF** - *all HyperTerminal commands are all lower-case.*

B **Press <Enter> key** to get the command-line prompt to appear.

C type **"run"** and press <**Enter**>

```
   7 = 600 SAC,  Solo Controller.
   8 = 635 CPU,  CPU for 635 controllers.
   9 = Remote DSI,  Far End Serial Interface.
   10 = 635 DPI,  DPI for 6xx controllers.
select> 10
test 635 DPI> run_
```

✓**VERIFY:** **Test Routine runs normally – each step passes**

```
  1e. reading CS and BM registers.
  1f. setting GPIO ports to initial values.
  test 1 passed.
Running Test 2 - Test D0-D7 with 256 patterns
  test 2 passed.
Running Test 3 - Test D0-D7, A0-A8 with 256 patterns
  3a. data = address.
  3b. data = address inverted.
  test 3 passed.
Running Test 4 - Test all RAM address lines.
  4a. writing patterns to RAM.
    0xFFFC00
  4b. reading patterns from RAM.
    0xFFFC00
  test 4 passed.
Running Test 5 - Test interface to CS8900A chip.
  test skipped, no CS8900A on this board.
```

✓**VERIFY:** **The PC will pause at the DIP SWITCH test.**

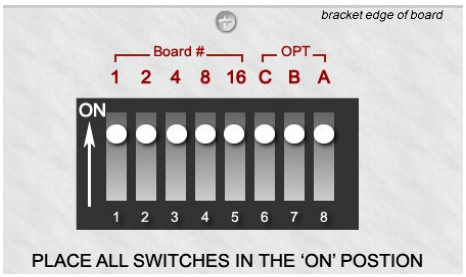
```
Hit the space bar to end test, if successful;
or any other key to stop test, if failure.

OPT BRD#
ABC-8421
10000001
```

SEE NEXT PAGE TO CONTINUE THE DIPSWITCH TEST.

STEP 6. TEST DIPSWITCH: This is a manual test of SW2 dipswitch.

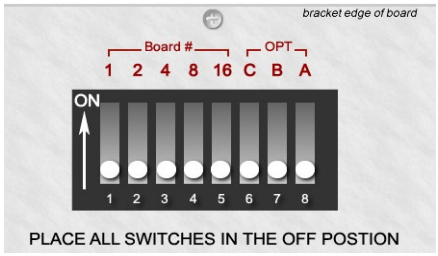
A Push all (SW-2) dipswitches to the **ON** position.

✓**VERIFY: the PC displays "11111111"**



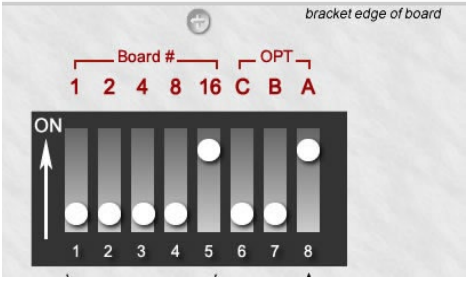
B Push all (SW-2) dipswitches to the **OFF** position.

✓**VERIFY: the PC displays "00000000"**



C Place only **switch 5** (#16) and **switch 8** (opt A) in the **ON** position.

✓**VERIFY: the PC displays "10010000"**



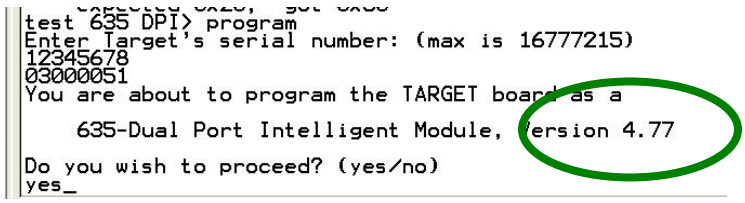
STEP 7. PROGRAMMING THE TARGET BOARD: this step covers configuring the Serial Number and loading the .S28 Flash file to the target DPI.

A. **Start the programming mode:**

1. Press the **<space bar>** to continue
2. type "**program**" and press <**Enter**>
3. Type in the **8-digit serial #** and press <**Enter**>.

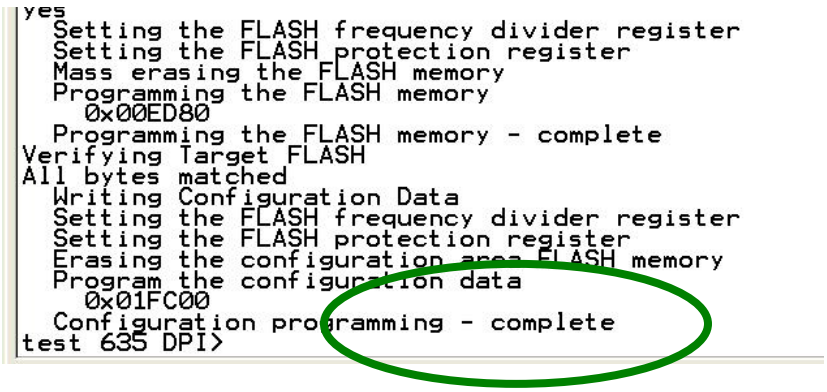
NOTE: The serial number printed on the sticker may not show the leading zero, but it must be entered.

✓**VERIFY:** that flash version is correct (according to Step-1A)



B type "**yes**" and press <**Enter**> *Flash file loads to the board*

✓**VERIFY:** that flash and completes successfully.



STEP 8. VALIDATING TARGET BOARD via HyperTerminal: This step confirms the serial number and flash Version are correct, validates the RS-232 and I2C ports are working and that daughter boards can be detected.

A. Connect the test cables as follows:

1) Disconnect the ***factory ribbon cable*** from the ***DPI*** **(J-2)**.
2) Connect the ***16-pin I2C-Buss ribbon cable*** to the **CPU (J-8) and** to the **DPI(J13)**.
3) Swap the **RS-232 cable** to the **CPU J4**

B. **RESET (SW-1) on the target DPI**

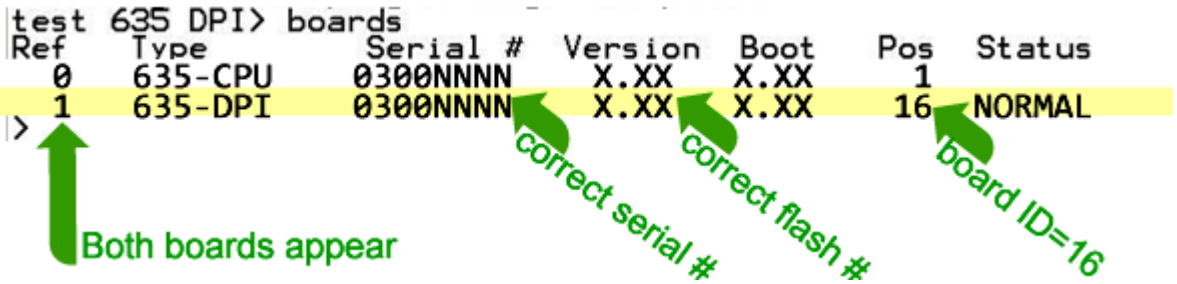
✓**VERIFY:** **visually check** the CPU's XMIT LED flickers once when the DPI RESET is pressed. This indicates that the 635 DPI is attempting to communicate with the CPU.

C. **type "boards" and press <Enter>**

(It may take a minute for daughter boards to display; re-issue 'boards' command if needed).

✓**VERIFY:** the boards command returns the correct information…

1) **<u>both boards are displayed</u>** on the buss - CPU and target DPI
2) **<u>DPI serial number</u>** is correct (from Step-7)
3) **<u>DPI flash version</u>** is correct (see step 1A)
4) **DPI <u>board ID = 16</u>** (from step 6)



STEP 9. FINISH BOARD: finish prepping the board for stock.

A Remove the TARGET DPI from the QC Test Jig:

1. **Turn OFF power to the test Bench**
2. Disconnect **2-PIN power cable** from the DPI
3. Disconnect the ***I2C Ribbon Cable***
4. Remove the DPI from the Test Jig
5. Remove the wiring harness from sections 1 & 2

B Affix the board stickers:

1. QC Stamp
2. Serial Number sticker
3. CE sticker
4. verify contents of attached Ziploc bag :

	ZIPLOCK #1
1	2-pin orange connector (power)
1	3-pin connector (lock power wiring)
2	9-pin connectors (reader ports)
4	3-pin connectors (relays 1 &2 on both ports)
	ZIPLOCK #2
2	Surge-suppression diodes (locks)
1	Set of instructions for installing diodes

…

C RETURN TO BEGINNING OF PROCEDURE TO CONTINUE TESTING NEXT BOARD

D When finished testing all boards, store the factory-designated baseline board in the pocket of the Primary Test Procedure. Also store wiring harness in the pocket of this procedure.

TERMS & REQUIREMENTS *used in this procedure*:

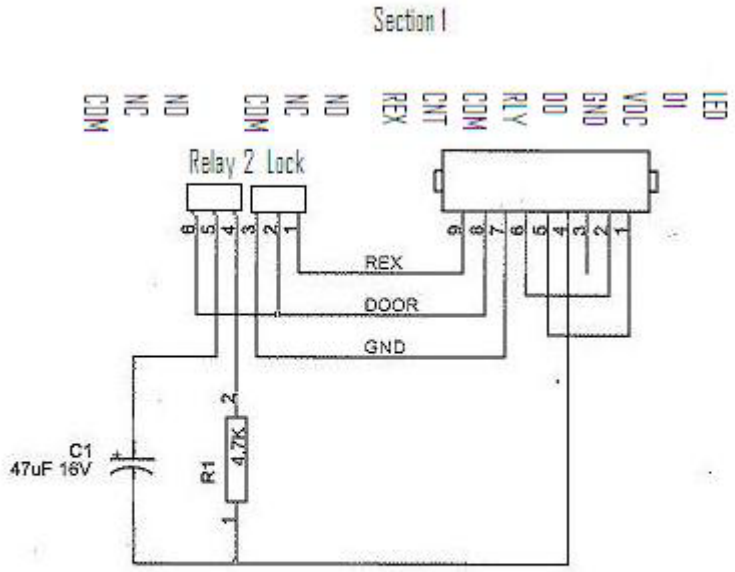
Baseline DPI	a ***factory-designated DPI*** that is used as a comparison during the visual inspection of the target DPI (i.e. when validating correct orientation of specific surface components, quality of soldering and component attachment, or board condition). ❗ The ***baseline DPI*** **MUST** be the ***factory designated board*** that **a.** is the **same model and revision** as the **target DPI**. **b.** and **has passed all factory testing** itself. **c.** and **has the appropriate surface components flagged** for cross reference.
Designated CPU	the board that is installed into the ***test jig*** to assist with validating the I2C Buss. ❗ **The *designated CPU* is a PERMANENT part of the test kit** ❗ **It MUST be tagged in a way that makes it easily identifiable - so it doesn't get mixed with boards going into stock.**
Factory Test Station	Is the *small circuit board* that attaches to the Factory port (J2) on the ***source CPU*** which is mounted on the back of test bench. The FTS uses a *14-pin ribbon cable* to attaches to the Factory port (J2) on the ***target CPU*** during testing & programming.
Source CPU	is the CPU (on the back of the test bench) that is used to perform the 'run' test and load flash to the target CPU. The ***source CPU*** stores the ***factory test program*** and the ***current flash code*** in its memory.
Target DPI	The ***target DPI*** is the board being tested and programmed.
Test Bench	is the ***entire test fixture*** used to perform the factory tests (including the ***source CPU*** and ***Factory Test Station board*** which are mounted on the back of the bench).
Test Jig	the ***test board receptacle (****including wiring harness****)*** that holds the ***target CPU*** during testing. The jig connects to the Factory Test Bench for power and data connections. The Test Jig and any wiring harnesses, cables and designated test boards must be kept together.

635 DPI Loopback Harness

Do not use if the loopback wiring is directly wired to the test jig.

If the loopback wiring is not present or not functioning, you will need to fabricate two harnesses in order to test both sections of a 635 DPI. (One harness for each section).

The harness is used in conjunction with the Factory Test Station to run function tests of all reader circuits on the 635 DPI.



Wire diagram shows connections as viewed from the bottom of the 635 DPI board.(silk screen) Wire Section 2 the same way.

Both sections wire as follows:

Reader section	Lock wiring
1=LED	1=NO
2=D-1	2=NC
3=VDC	3=COM
4=GND	
5=D-0	**Relay 2 wiring**
6=RLY	4=NO
7=COM	5=NC
8=CNT	6=COM
9=REX	

DO NOT PRINT OR POST THIS PAGE IN THE FACTORY TEST BINDERS

Revision History Table

DATE OF REVISION	REVISION DESCRIPTION	UPDATED BY
1/14/2014	Updated flash version from 4.77 to 5.04	C. Roberts
1/14/2014	REVISION 5.0: 1. p3 Section-1 Part-B, item 4) = changed instruction from using loopback connectors to using test jig with the loopback wiring installed. 2. p7 = changed step 1 to use test jig with loopback wiring instead of loopback connectors if wiring is installed on underpins of test jig. 3. p11 – inserted notice that loopback harness is not needed if loopback wiring is directly applied to the test jig.	C, Roberts
1/17/2014	Added the Revision History Table	C. Roberts
1/17/2014	Revised and clarified the Print Instructions on page 2 to include the steps to manually update the flash version field in case the field doesn't auto-update when sent to printer.	C. Roberts