TB-2198

XCede® DAUGHTERCARD CONNECTOR PRESS-FIT INSTALLATION PROCESS

Revision “D“

Specification Revision Status

Revision	SCR No.	Description	Initial	Date
“ – “	S0994	Initial Release	J. Lehman	08/15/08
“A”	S1189	Add 3 and 5 Pair Product	T. Sloan	02/10/09
“B”	S1887	Added RAM Product and General Clean-up	M. Snyder	01/04/12
“C”	S2476	Update Max press force per pin	E. Lukin	09/30/13
“D"	S3119	Corrected tool number in 2.2.2.3	T. Nierendorf	09/08/14

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1.0 SCOPE

1.1 This document describes the methods and tooling for the installation of Amphenol TCS XCede right angle press-fit daughtercard connectors onto a printed circuit board (PCB). See Appendix "A" for the seating press recommendations and process recommendations.

2.0 REFERENCE

2.1 DOCUMENTS

2.2 TOOLING

2.2.1 Press System

The application of Amphenol TCS XCede press-fit style components can be performed across many different press platforms, however there are minimum performance features and capabilities that are strongly recommend be available:

2.2.1.1 Force Requirement

The XCede daughtercard connector can be assembled using individual segments up to 8" in length (8 inches for 2, 3, and 4 pair connectors and 6 inches for 5 and 6 pair connectors), and segments may be joined after individual pressing to total over 18" in length. Typically, XCede compliant pins will require an insertion force of 2-10 lbs/pin. The press must have the capability of installing connectors with a maximum force of 10 lbs per pin. ATCS recommends using an ASG MEP 12T electric press for installing daughtercards. Air or hydraulic presses are typically not as well suited for controlled press rate and controlled force for daughtercard installations.

2.2.1.2 Rate

Recommended press head installation rate is 0.05 +/- .01 in/sec with the appropriate installation force.

2.2.1.3 Structure

The press, fixture, and tooling combination need to be adequately rigid such that there is a minimum deflection during the pressing process, and the forces are transmitted directly to the connector without inducing any side load or moment onto the connector assembly. The press also needs to be capable of applying a pre-load force minimum of 100lbs, and dwelling at that Z-height for approximately 1-2 seconds. This allows the press system to stabilize prior to actual insertion.

2.2.1.4 Feedback

The application press should have the capability to monitor, display, record, and feed back insertion force data to the Z axis speed controller throughout an individual press cycle. This capability allows for continuous insertion process monitoring, technical analysis and data collection in the event of a failure, and will alert the operator in the case of a mechanical machine problem. Speed or height controls should also allow a temporary press cycle stop at a repeatable position with reference to the board surface, or with reference to the insertion force. This ability is a requirement in certain connector and board combinations.

2.2.2 Application Tools

XCede daughtercard connectors have dedicated loading heads for each product type and size. There are different loading head lengths available for each daughtercard product (refer to section 2.2.2.1 – 2.2.2.7). Amphenol TCS recommends that customers and contract manufactures purchase the loading head tooling from ATCS to ensure proper clearances for the daughtercard installation.

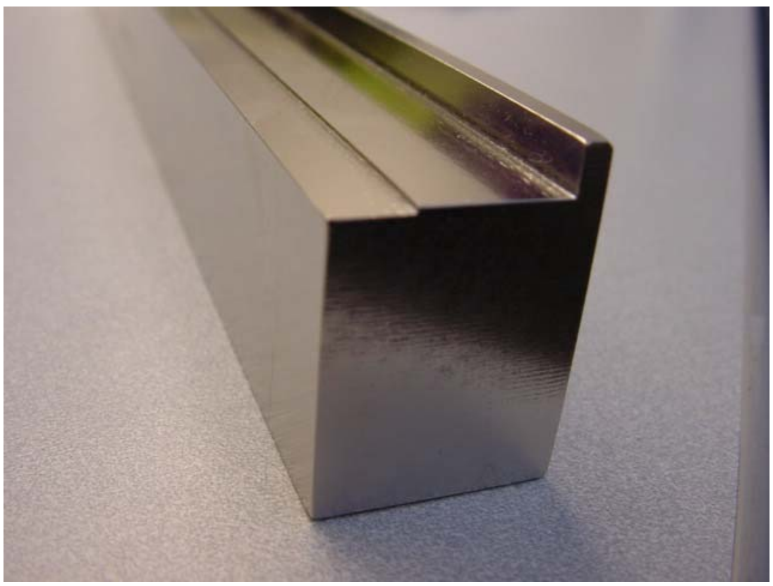

Figure 1. 4 Pair Daughtercard Application Tool

2.2.2.1 XCede RAF 2 Pair Application Tools

694-4554-000 – 2-Pair RAF Loading Head 1.2” Long

694-4555-000 – 2-Pair RAF Loading Head 2.0” Long

694-3658-000 – 2-Pair RAF Loading Head 4.0” Long

694-3659-000 – 2-Pair RAF Loading Head 6.0” Long

694-3660-000 – 2-Pair RAF Loading Head 8.0” Long

694-3661-000 – 2-Pair RAF Loading Head 10.0” Long

694-3662-000 – 2-Pair RAF Loading Head 12.0” Long

2.2.2.2 Xcede RAF 3 Pair Application Tools

694-4556-000 – 3-Pair RAF Loading Head 1.2” Long

694-4557-000 – 3-Pair RAF Loading Head 2.0” Long

694-3317-000 - 3-Pair RAF Loading Head 4.0” Long

694-3318-000 - 3-Pair RAF Loading Head 6.0” Long

694-3319-000 - 3-Pair RAF Loading Head 8.0” Long

694-3320-000 - 3-Pair RAF Loading Head 10.0” Long

694-3321-000 - 3-Pair RAF Loading Head 12.0” Long

2.2.2.3 XCede RAF 4 Pair Application Tools

694-4558-000 – 4-Pair RAF Loading Head 1.2” Long

694-4559-000 – 4-Pair RAF Loading Head 2.0” Long

694-2985-000 – 4-Pair RAF Loading Head 4.0” Long

694-2986-000 – 4-Pair RAF Loading Head 6.0” Long

694-2987-000 – 4-Pair RAF Loading Head 8.0” Long

694-2988-000 – 4-Pair RAF Loading Head 10.0” Long

694-2989-000 – 4-Pair RAF Loading Head 12.0” Long

2.2.2.4 XCede RAF 5 Pair Application Tools

694-4560-000 – 5-Pair RAF Loading Head 1.2” Long

694-4561-000 – 5-Pair RAF Loading Head 2.0” Long

694-2992-000 – 5-Pair RAF Loading Head 4” Long

694-2993-000 – 5-Pair RAF Loading Head 6” Long

694-2994-000 – 5-Pair RAF Loading Head 8” Long

694-2995-000 – 5-Pair RAF Loading Head 10” Long

694-2996-000 – 5-Pair RAF Loading Head 12” Long

2.2.2.5 XCede RAF 6 Pair Application Tools

699-2285-000 - XCede 6-Pair RAF Loading Kit (0.5" to 6.0" long)

2.2.2.6 XCede RAM and Extended RAM 2 Pair Application Tools

694-4528-000 – 2-Pair RAM Loading Head 1.2" Long

694-4529-000 – 2-Pair RAM Loading Head 2.0" Long

694-4530-000 – 2-Pair RAM Loading Head 4.0" Long

694-4531-000 – 2-Pair RAM Loading Head 6.0" Long

694-4532-000 – 2-Pair RAM Loading Head 8.0" Long

694-4533-000 – 2-Pair RAM Loading Head 10.0" Long

694-4534-000 – 2-Pair RAM Loading Head 12.0" Long

2.2.2.7 XCede RAM 4 Pair Application Tools

694-4484-000 – 4-Pair RAM Loading Head 1.2" Long

694-4485-000 – 4-Pair RAM Loading Head 2.0" Long

694-4486-000 – 4-Pair RAM Loading Head 4.0" Long

694-4487-000 – 4-Pair RAM Loading Head 6.0" Long

694-4488-000 – 4-Pair RAM Loading Head 8.0" Long

694-4489-000 – 4-Pair RAM Loading Head 10.0" Long

694-4490-000 – 4-Pair RAM Loading Head 12.0" Long

2.2.3 Support Tooling/Fixture

Customers and contract manufactures should design or purchase the appropriate support fixture to support the PCB during the daughtercard installation process. Support fixtures are to provide adequate support for the required number of pins being pressed directly under the connector pattern. The support fixture should also be designed to accommodate for the compliant pin lead protrusion on the secondary side of the PCB. Refer to XCede daughtercard customer use drawings for the compliant pin lead protrusion dimensions. The support fixture is not supplied by Amphenol, if assistance with the fixture design is needed please contact your local field application engineer.

3.0 PROCEDURE

Step 1. Locate the correct seating head and support pallet/fixture

Step 2. Place the support fixture (pallet) onto the press bed, and ensure:

- Pallet is square with reference to the press head
- Pallet is flat to the press bed, with no excessive bow or twist
- PCB board is pinned to the pallet
- Pallet is pinned to the press bed

Step 3. Ensure the press has the required installation force, alignment, and speed controls capable of pressing the specific configuration connector being installed. Refer to section 2.2.1 for the recommended force and press head rate.

Step 4. Place the PCB onto the pallet, and remove the connector from the packaging. If the connector is supplied in a tray, simply remove the cover and lift the connector from the tray. If the connector is supplied in a tube, first remove the shipping tape and hardware. If the tube has a retaining pin, cut the pin with wire cutters, and remove the end connector. Lay the tube on a flat table with the connector compliant pins facing up. To properly remove the connectors from the tube, use a round or square rod to push the connectors out one at a time.

Step 5. Verify the compliant pins of the connector were not damaged or bent during shipping or removal from the packaging. Visually inspect for bent pins, looking down both the width and length of the connector pin pattern for any grossly misaligned pins. If a compliant true position gage has been ordered, place the connector onto the gage in the same manner as the connector would be placed onto a PCB, and look for any difficulty during placement, or any compliant pins that do not protrude out the back side of the gage. If any compliant pins are out of position or broken, discard the connector and begin Step 5 again with a new connector.

> NOTE: Amphenol TCS recommends the purchase or the design and manufacture of a daughtercard compliant pin true position gage for the specific configuration of the connector being installed. The compliant pin true position gage can ensure that the compliant pins are in their proper position immediately before the connector is placed onto the board, significantly reducing the possibility of connector or PCB damage. Contact your local Amphenol TCS application engineer for ordering information of this part.

Step 6. When placing the daughtercard connector on the PCB, orient the board and pallet so when the connector is placed, the window side will be facing you and the stiffener side will be facing away from you.

Hold the connector up off the PCB, and place the back row of compliant pins into the correct plated through hole (PTH), see Figure 2. With the front of the connector still up off the board, roll the connector back to front, into the remaining PTHs (see Figures 3-4).

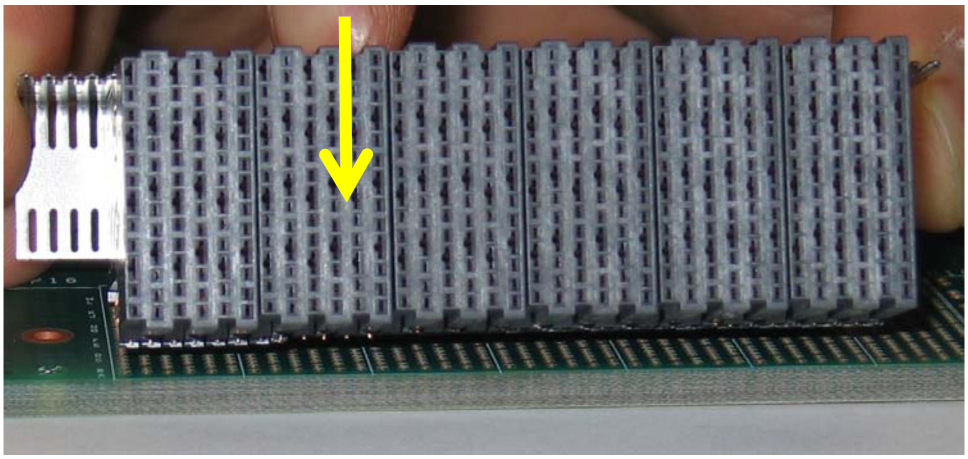

Figure 2. Back row of the DC connector compliant pins in the PTH.

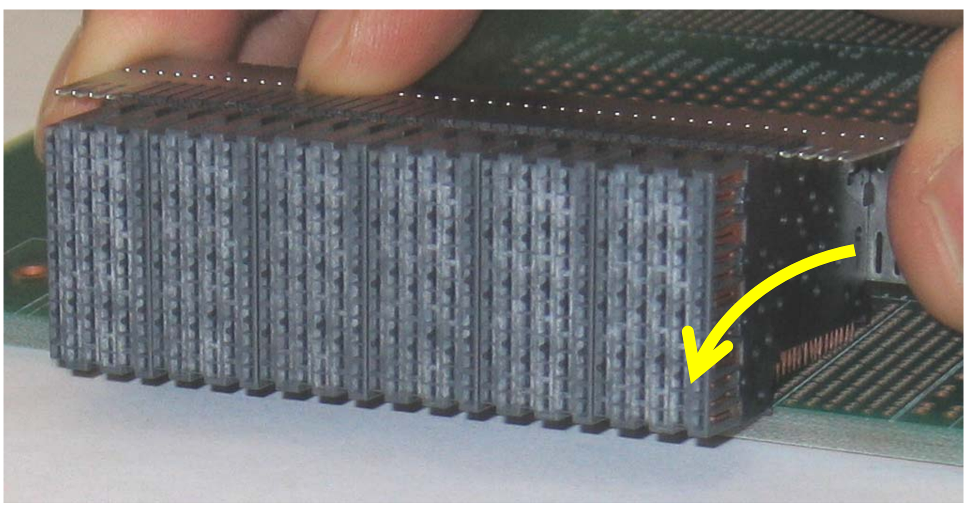

Figure 3. With the back row entirely placed, roll connector toward board edge placing the remaining rows of compliant pins.

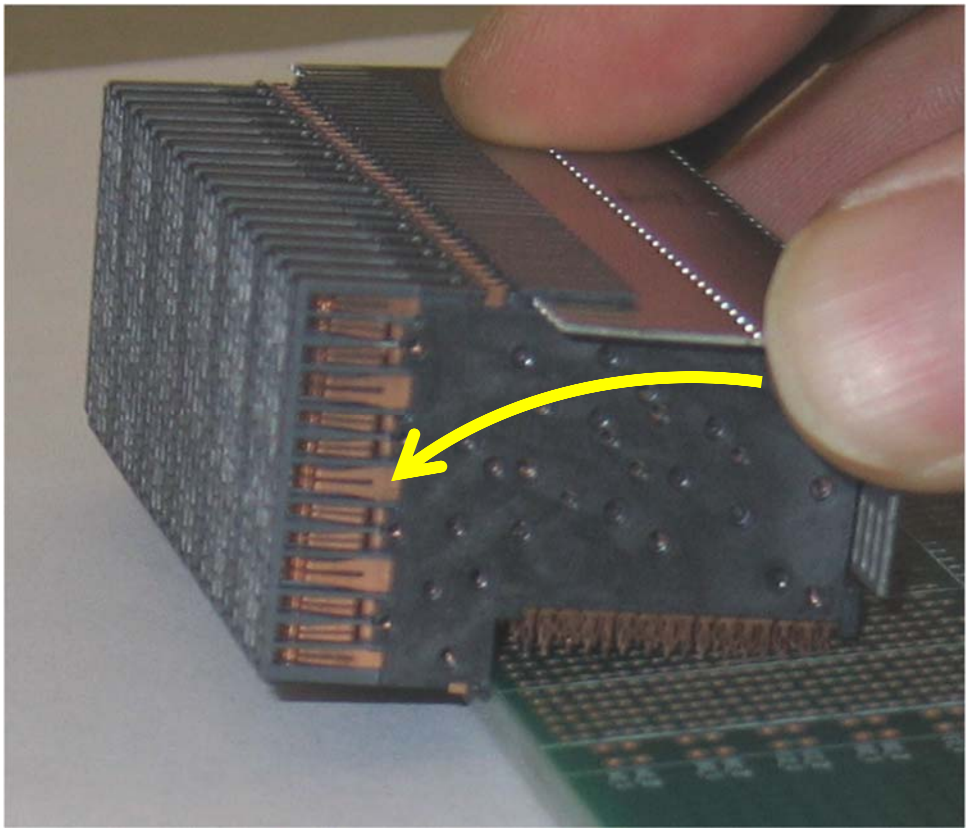

Figure 4. Side view: Roll connector toward board edge placing the remaining rows of compliant pins.

Step 7. Check for any bent pins protruding from under the connector assembly (see Figure 6).

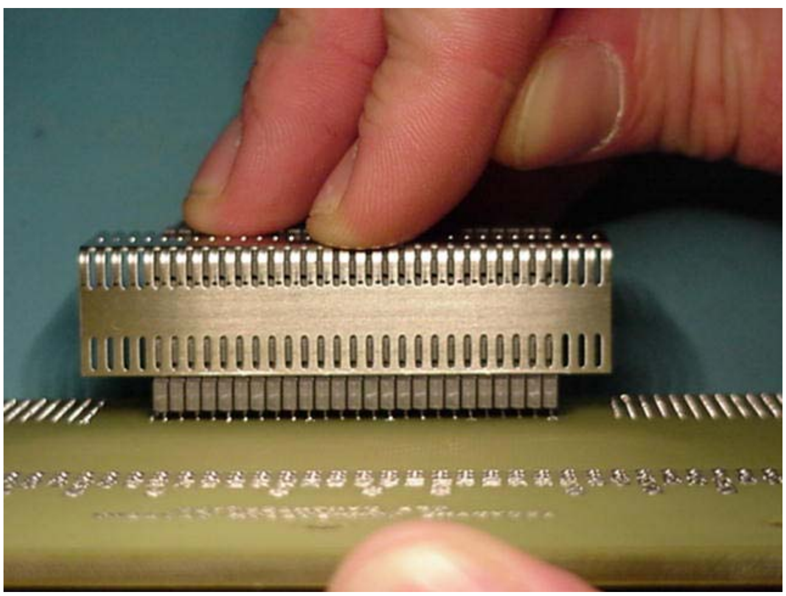

Figure 6. Rear view of the assembly. Check for bent pins.

Step 8. Select the correct seating head based on the connector type and the length of the connector (see Figure 7). Ensure the seating head at a minimum is the same length as the connector (see Figure 8). Position the seating head directly on top of the connector, ensuring the clearance slot is over the wafer “retention hats” and the rear alignment rib is against the stiffener back (see Figure 9).

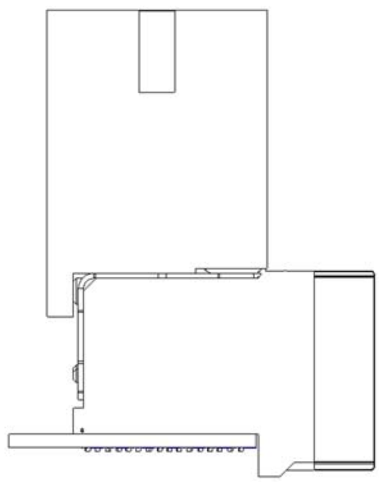

Figure 7. 4 Pair Loading Head and Module

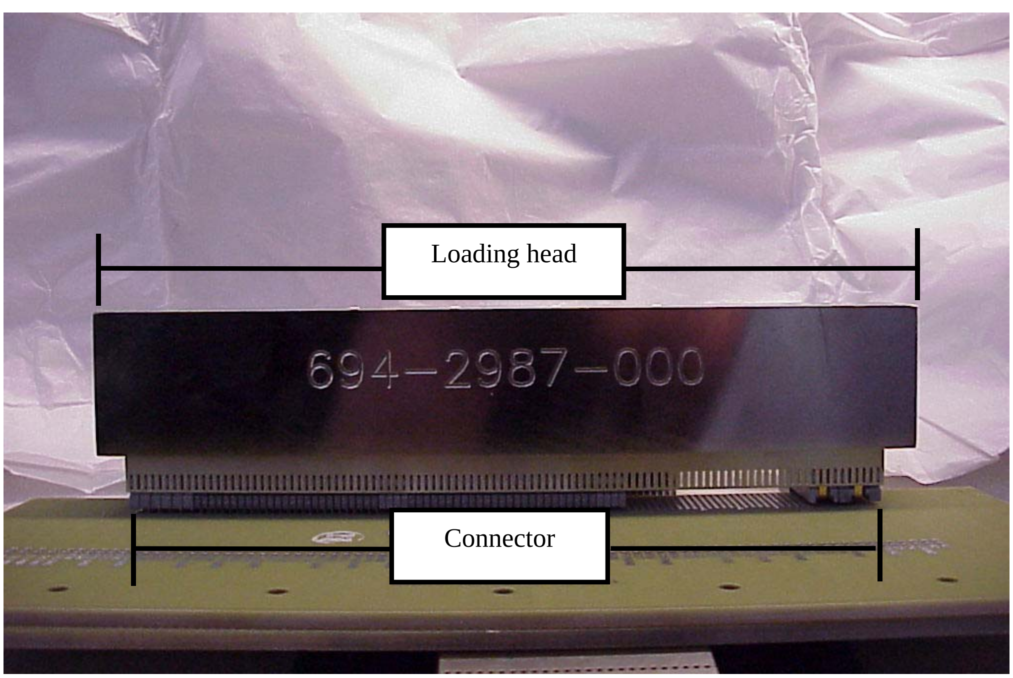

Figure 8. Connector seating head extending over the edge of daughtercard connector

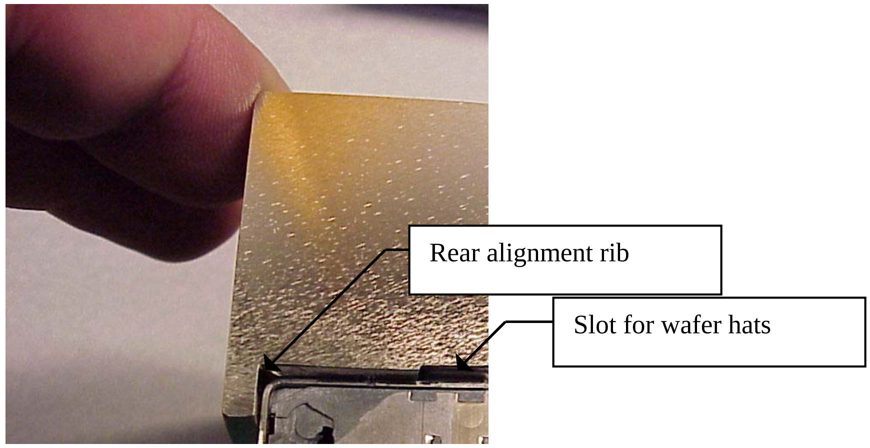

Figure 9. Clearance slot for wafer “retention hats” and rear alignment rib.

NOTE: Ensure the seating head does not come into contact with any other components on the PCB adjacent or behind the connector throughout the placement and pressing process. See the XCede Removal and Repair Spec (TB2217) for rework keep out zones.

Step 9. Initiate the press cycle and seat the connector onto the board surface.

Step 10. Visually identify the plastic standoff on the stiffener side of the connector, contacting the board surface.   This standoff cannot be more than 0.125mm from the board surface, and there should be minimal visible difference in height between adjacent wafers (see Figure 9).

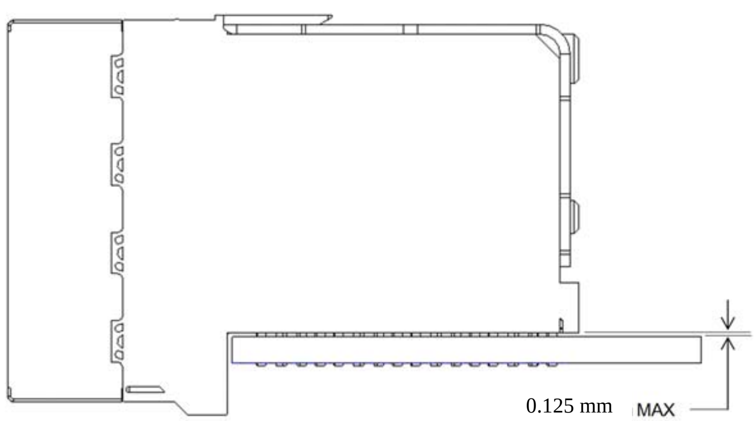

Figure 9. 0.125 mm maximum height off board surface

Step 11. If the PCB thickness allows, inspect the connector pattern from the secondary side, and verify the presence of a compliant pin tip in each PTH.

Appendix A – XCede Daughtercard Press Recommendations and Pressing Procedures

XCede Daughtercard Press Recommendations

The press used for inserting XCede daughtercard connectors into the PCB should have the minimum capabilities defined as follows:

1) The press shall be suitably rigid and stiff to provide a stable platform to support the installation of any size connectors. Installation forces will vary depending on connector size, plated through hole size, and plated through hole finish (give an example). The press, tooling and fixtures need to be sufficiently rigid to prevent any bowing or deflection during the installation process.

2) ATCS recommends a press that has the capability to apply a pre-load force of approximately 100lbs and dwelling at that force for approximately 1-2 sec. This allows the entire press setup to stabilize just prior to inserting the connector into the plated through hole. This pre-load force eliminates any bow that might exist in the PCB and firmly seats the connector into the PTH just prior to the installation process.

3) The press shall be capable of controlling the insertion rate. ATCS recommends an insertion rate of 0.050 in/sec to ensure the compliant pins are properly inserted into the PTH and reduces any damage to the PTH.

4) The press shall be capable of a pressing process per a force gradient curve. To do this, the press must have real time force feedback from the press head and the necessary software, this allows for consistent daughtercard connector installation and accounts for PCB thickness and connector height tolerances. It is not recommended to insert daughtercard connectors to a specific height, due to the PCB and connector tolerances build up. Installing a daughtercard connector to a specific height may result in over seating or under seating the connector. Over seating a daughtercard connector can cause damage to the connector and/or the PCB. Under seating the connector will not fully insert the compliant pin into the PTH and can cause mechanical and reliability issues.

NOTE: Amphenol TCS recommends using the Tyco Electronics (ASG) MEP-12T for all XCede connector pressing. The MEP-12T has all of the capabilities outlined above.

XCede DC Recommended Press Procedures

The following are recommended process steps to follow when installing XCede DC connectors.

1) Each PCB should be inspected for blocked holes. This can be accomplished by simply holding the board up to a light and visually looking at the connector plated through hole pattern for any holes that are not clear. This ensures that the connector will insert and seat properly into the PCB.

2) Each PCB should be inspected for the finished hole size (FHS). Compliance to the required FHS is important in maintaining a consistent pressing process, refer to TB2149 for FHS requirements. Approximately 6-12 holes should be inspected across the connector hole pattern.

3) After pressing, the completed assembly should be inspected.
   a. First, inspect the PCB opposite the connector to verify that the compliant pins are in the holes. If a pin is missing the assembly can be repaired by removing the defective daughtercard module and inserting a new one per TB-2217. The most common cause of a missing pin is improper loading of the connector, which causes a bent pin prior to pressing.
   b. Second, inspect the connector from the press-fit side of the PCB. Confirm that all plastic standoffs on both the front and back of the connector (either side of compliant pin field) are seated evenly against the PCB along the length of the connector. The standoffs can be as much as 0.125mm (0.005”) maximum above the PCB surface, but should be even across the connector. Connectors may be repressed if found to be not properly seated. The plastic standoffs should not be cracked, deflected, or otherwise damaged, as a result of over-pressing.

For customers who are using an MEP 12T press, please contact your local ATCS application engineer for tooling and fixturing support.

XCede DC Recommended Press Settings for Tyco (ASG) MEP-12T Presses

The following settings are recommended for applying XCede connectors using MEP-12T presses. If the press is not an MEP-12T, please contact your ATCS application engineer for assistance.

Figure A-1. MEP-12T Manual-Electric Press.

Amphenol-TCS has developed a press profile that can be used on MEP presses to install XCede connectors onto PCBs. The profile utilizes force feedback features on the MEP-12T press that ensure proper pressing of connectors. The XCede press profile developed by Amphenol-TCS is named: *ATCS_STD_FG_DWELL.prf*

- If this profile is not installed on your press, please contact your ATCS fields application engineer for assistance. Other profiles tailored to specific connector and application needs may also be used, consult your ATCS fields application engineer for more information and assistance.

The following steps describe proper creation, setup, and application of XCede Daughter Card connectors:
The MEP press main menu has 4 major screens that are required to setup a connector, tool and PCB for pressing (See Figure A-2):

- 1 - Tool Editor
  This screen is where the tool name, ID and dimensions are entered.
- 2 - Connector Editor
  This screen is where connector name, dimensions, pin count, error limits, and termination method are entered.
- 3 - Profile Editor
  This screen is where the list of action steps for the press to execute is entered (the *ATCS_STD_FG_DWELL.prf* profile)
- 4 - Press Data Editor
  This screen is where a PWB is assigned connectors to be pressed, board thickness, and fixture thickness.

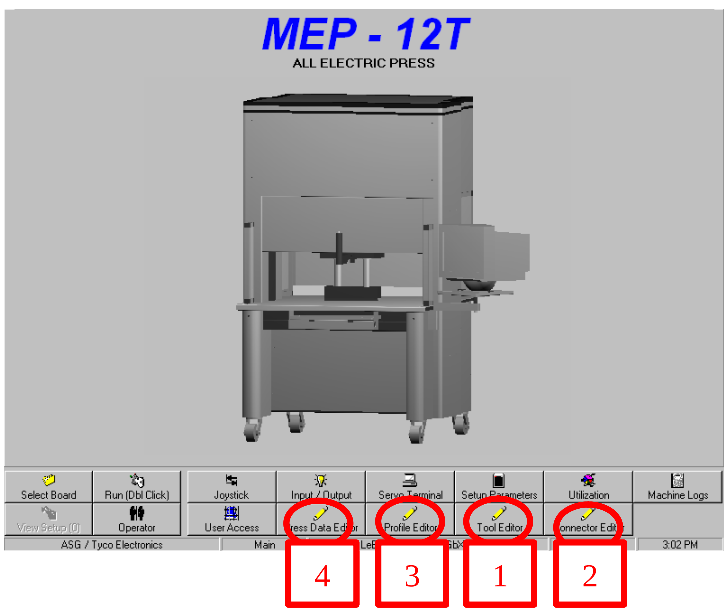

Figure A-2. Main Menu of MEP-12T Press.

1 - Tool Editor:
The Tool Editor screen allows for the creation of a new tool (See Figure A-3). This screen is the setup for top tooling only. Bottom tooling setup is in the press data editor screen and is categorized as "Fixture" (See Press Data Editor Screen).

- Tool Type – Unique identifier (User specified).
- Tool ID – Tool part number (User specified).
- Tool Clearance – Typically 0.100 inches unless additional height is needed for taller components on PWB.
- Tool Height – Overall height of tool from top of tool to tool contact point of connector.
- Tool Width – Width of tool.
- Tool Length – Length of tool.

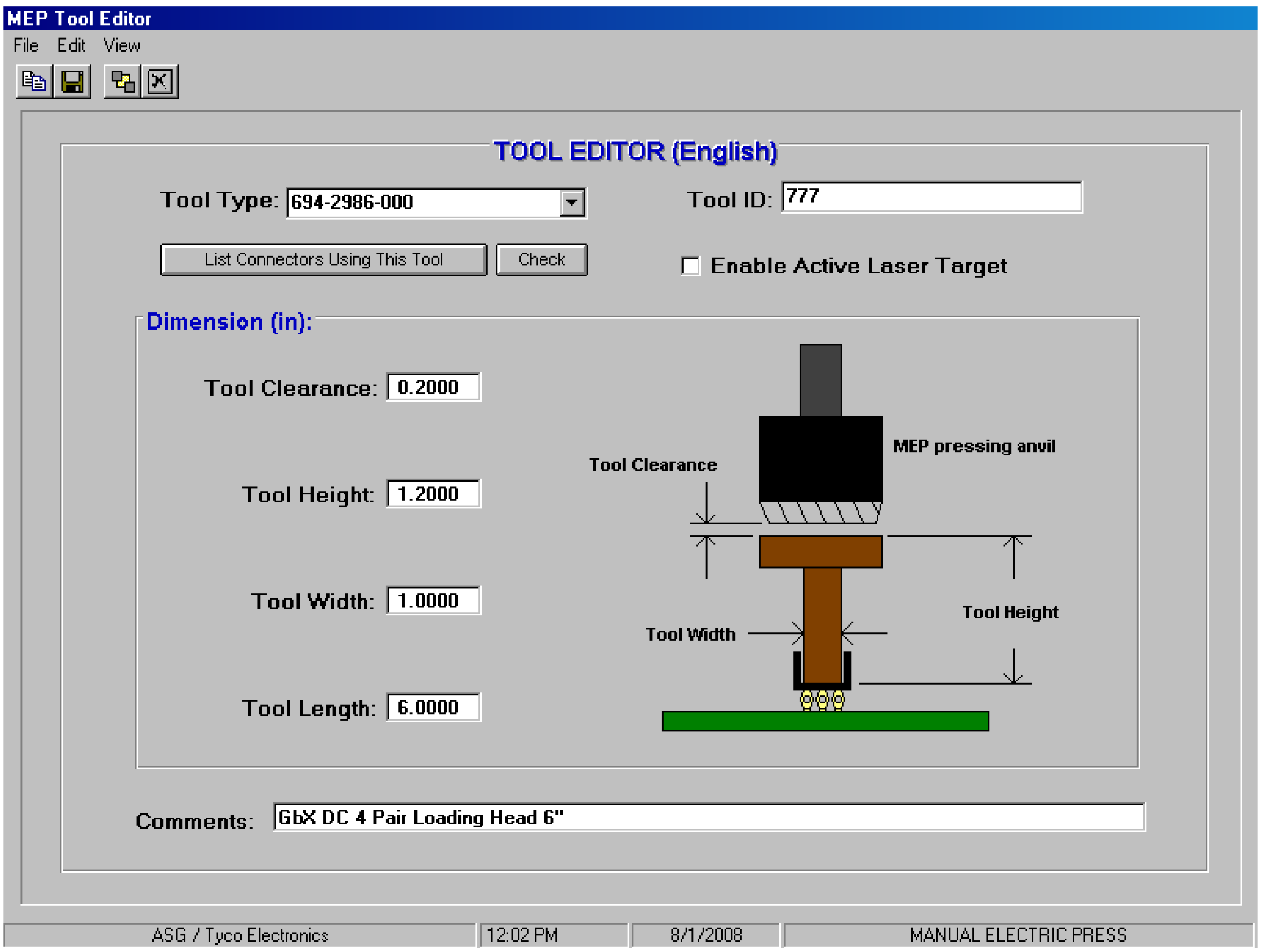

Figure A-3. Tool Editor Screen of MEP-12T Press. (Representative screen – tool length can vary based on connector configuration)

2 – Connector Editor:
The Connector Editor screen allows for the creation of a new connector (See Figure A-4).

- Connector – Part number for connector being created (User specified).
- Tool – “Tool Type” and “Tool ID” from Tool Editor screen.
- Profile – Pressing profile used by the MEP-12T to install the XCede connector (Amphenol-TCS recommendation is *ATCS_STD_FG_DWELL.prf*)
- Number of Pins – Sum of all pins entering PTHs on the connector (signal, shield, and power).
- Graph Scale – 6.0 for XCEDE Nano Pin (0.0177” Drill) Daughter Card
- Graph Scale – 8.0 for XCEDE Standard Pin (0.0217” Drill) Daughter Card
- Distance – 0.1500
- Min Force / Pin – 0.5
- Max Force / Pin – 6.0 for XCEDE Nano Pin (0.0177” Drill) Daughter Card
- Max Force / Pin –8.0 for XCEDE Standard Pin (0.0217” Drill) Daughter Card
- User Force / Pin – Not used for *ATCS_STD_FG_DWELL.prf* profile.
- Other Force – Not used for *ATCS_STD_FG_DWELL.prf* profile.
- PARS – Not used for *ATCS_STD_FG_DWELL.prf* profile.
- Force Gradient Degrees – 75.0.
- SPC – Values to be dictated by process owner. Not covered in this document.
- Dimension – Unique to connector being installed. See Figure A-5.

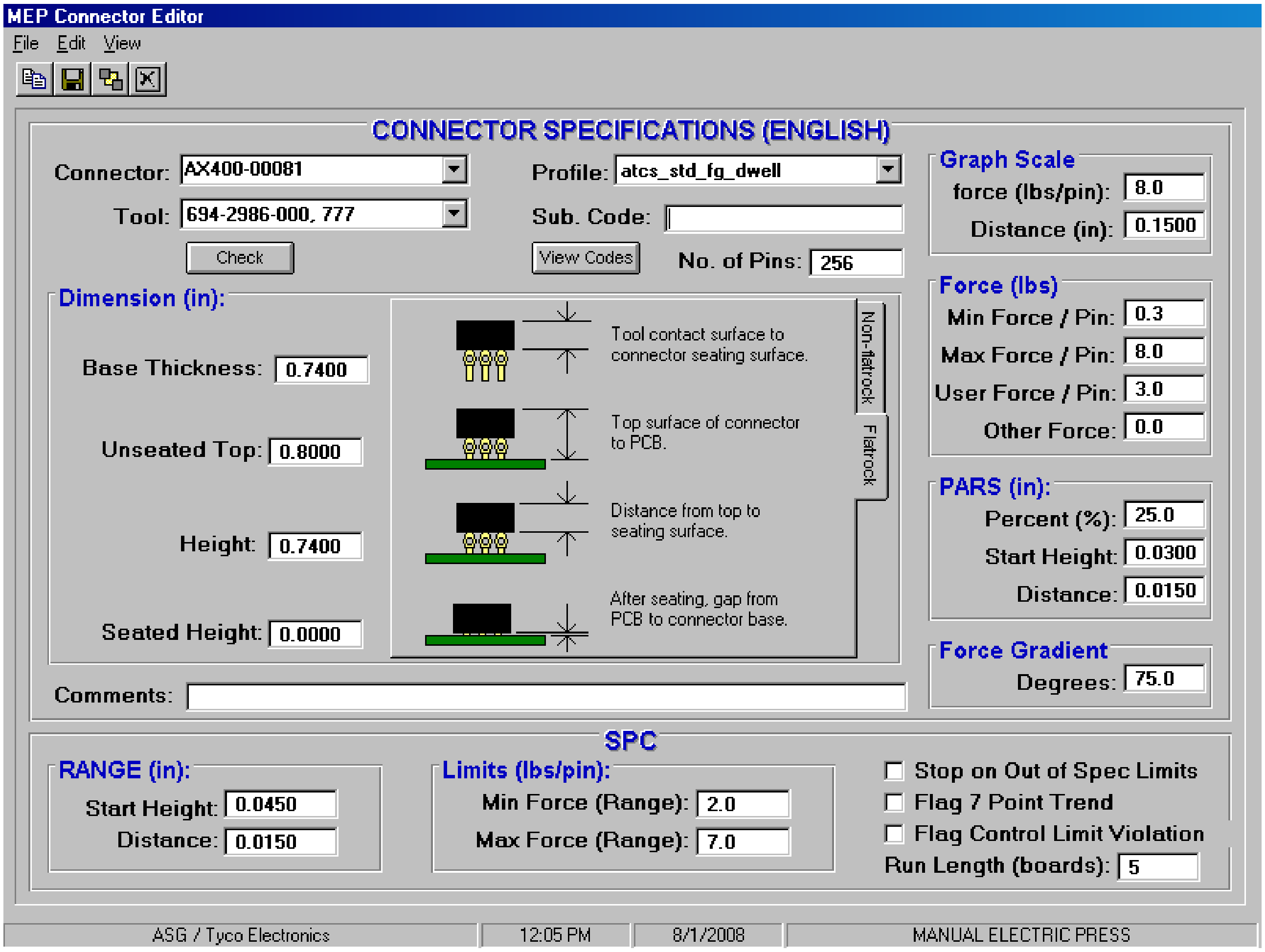

Figure A-4. Connector Editor Screen of MEP-12T press.

The dimensions of connectors that are critical to proper installation onto a PWB are:

- Base Thickness – The connector thickness between the contact point of the installation tool and the seating surface of the connector.
- Unseated Top – The unseated connector height from the contact point of the installation tool to the PWB surface.
- Height – Same as Base Thickness for XCede Connectors.
- Seated Height – Gap between PWB and connector seating surface, ideally 0.00.

Figure A-5 below describes the dimension values for the Connector Setup screen of the MEP-12T press for the various XCede Daughter Card connector sizes. If a particular XCede connector is not listed, please consult your Amphenol-TCS representative for assistance.

XCede Daughtercard Dimensional Values					
Connector Type/Size	Base Thickness[1] (inches)	Unseated Top[1,2] (inches)		Height[1] (inches)	Seated Height (inches)
		Standard Pin	Nano Pin		
2-pair	0.36	0.39	0.38	0.36	0
3-pair	0.55	0.58	0.57	0.55	0
4-pair	0.76	0.79	0.78	0.76	0
5-pair	0.97	0.99	1.00	0.97	0
6-pair	1.18	1.30	1.20	1.18	0
2-pair RAM	0.37	NA	0.39	0.37	0
4-pair RAM	0.72	0.86	0.74	0.72	0
2-pair EXT RAM	0.83	NA	0.85	0.83	0

1. Contact point of installation tool measured from the metal stiffener (see Figure A-6).
2. Can vary slightly based on PTH finished hole size.

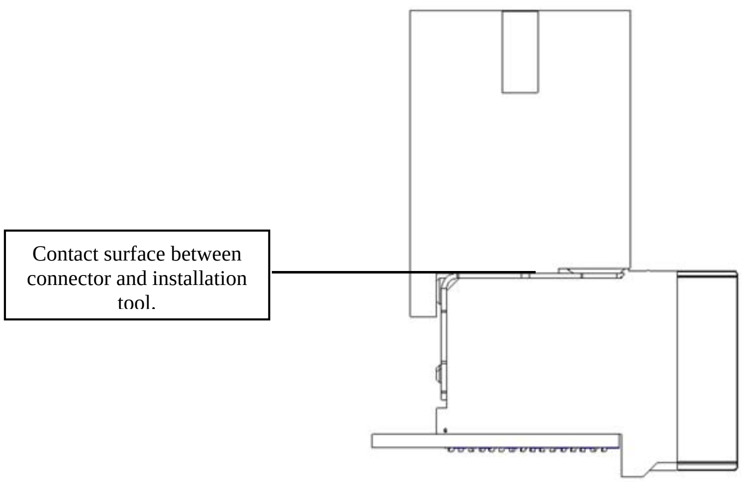

Figure A-5. Connector Setup dimensions for XCede connectors for MEP-12T press.

3 – Profile Editor:

The Profile Editor screen provides the detail of the Amphenol-TCS *ATCS_STD_FG_DWELL.prf* profile created for installing XCede connectors onto PWBs (See Figure A-6). Rows 1 through 5 are the commands for a normal press sequence. Rows 6 through 9 are the commands for a "Re-Press" sequence. At each step in the profile sequence, the press executes on the event that occurs first. If the "Height Above Board" occurs first, then the press executes the "Height Action". If the "Force" occurs first, the press executes "Force Action".

The press speed during the press sequence is set to 0.050 inches / second. This speed is intended to ensure that the XCEDE compliant pins remain stable during the pressing process. Speeds exceeding this are not recommended, and may result in connector pressing failures. Row 3 has a 1.5 second delay built into the press profile as a settling time for connectors to minimize the potential for pressing failures.

- Profile – Set of steps found in *ATCS_STD_FG_DWELL.prf* profile to perform normal press and re-press operations for XCede connectors
- Sample Range for PARS Forces – Not used in *ATCS_STD_FG_DWELL.prf* profile.
- Action Errors – Messages that appear on MEP-12T monitor if error occurs.

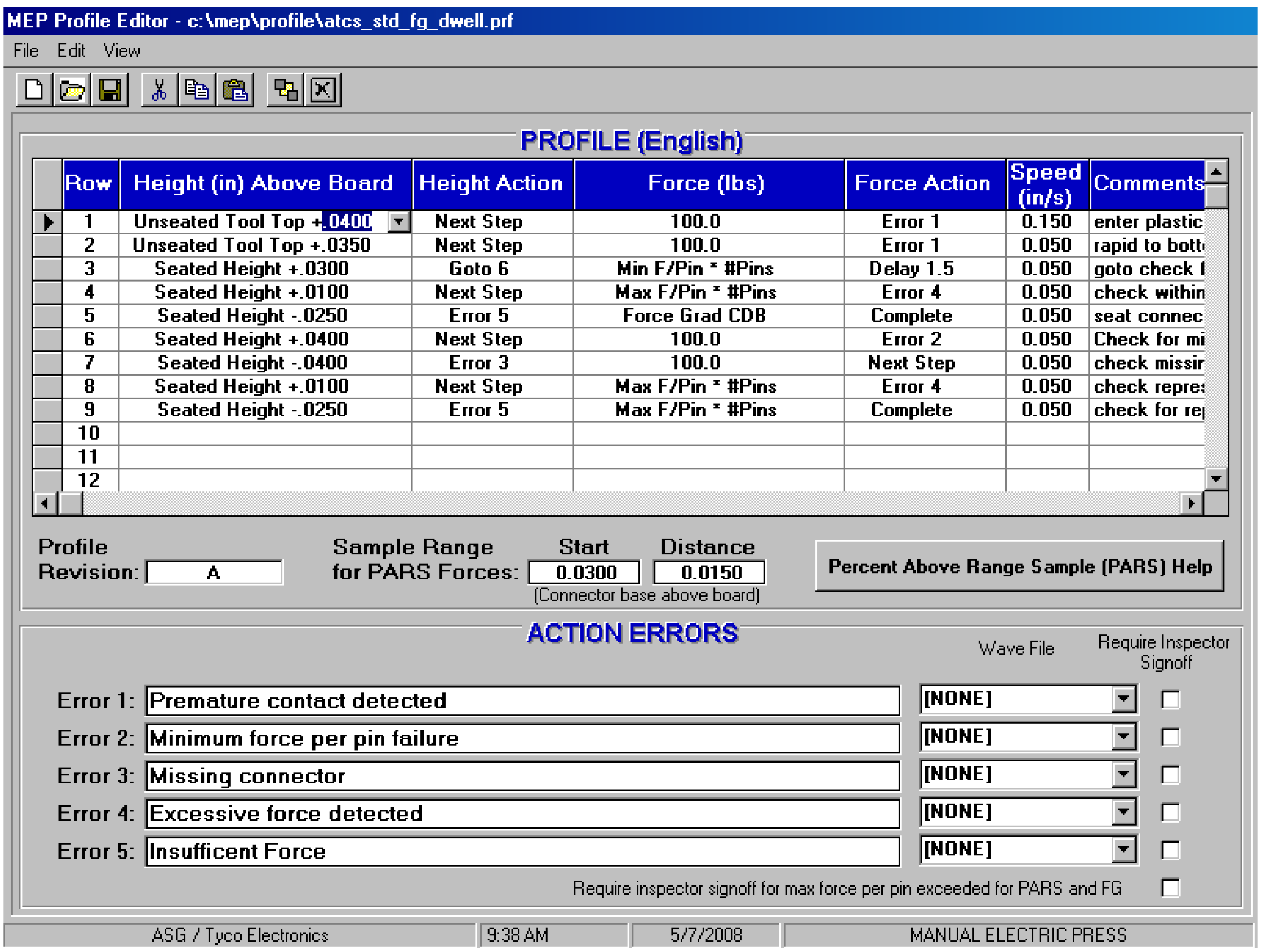

Figure A-6. Profile Editor of MEP-12T press displaying the Amphenol TCS *ATCS_STD_FG_DWELL.prf* profile, Revision A.

4 – Press Data Editor:
The Press Data Editor screen allows for the creation of a unique PWB assembly (See Figure A_7).

- Description – Unique identifier of assembly (User specified).
- Revision – To be determined by process owner (User specified).
- Board Thickness – Thickness of raw PWB in inches in the location of the XCede connector. This value may be determined by a board thickness measurement taken automatically prior to press cycle (not covered in this document).
- Fixture Thickness – Thickness of bottom fixture or pallet to ensure that any XCede connector over hang will not interfere with the MEP-12T press surface (See Figures A-8 and A-9). This thickness includes any tooling between "machine zero" and the bottom surface of the PWB. "Machine zero" is the original press table top, or may be reassigned as the top of a permanent bottom fixture or rolling table.
- Fixture ID – To be determined by the process owner (User specified).
- Press Sequence – Connector pressing order to be determined by process owner.
  - X, Y, and Angle – Locations of the connector being placed on PWB. To be determined by process owner.
  - Connector – Select XCede connector from pull down menu in "Connector" cell.

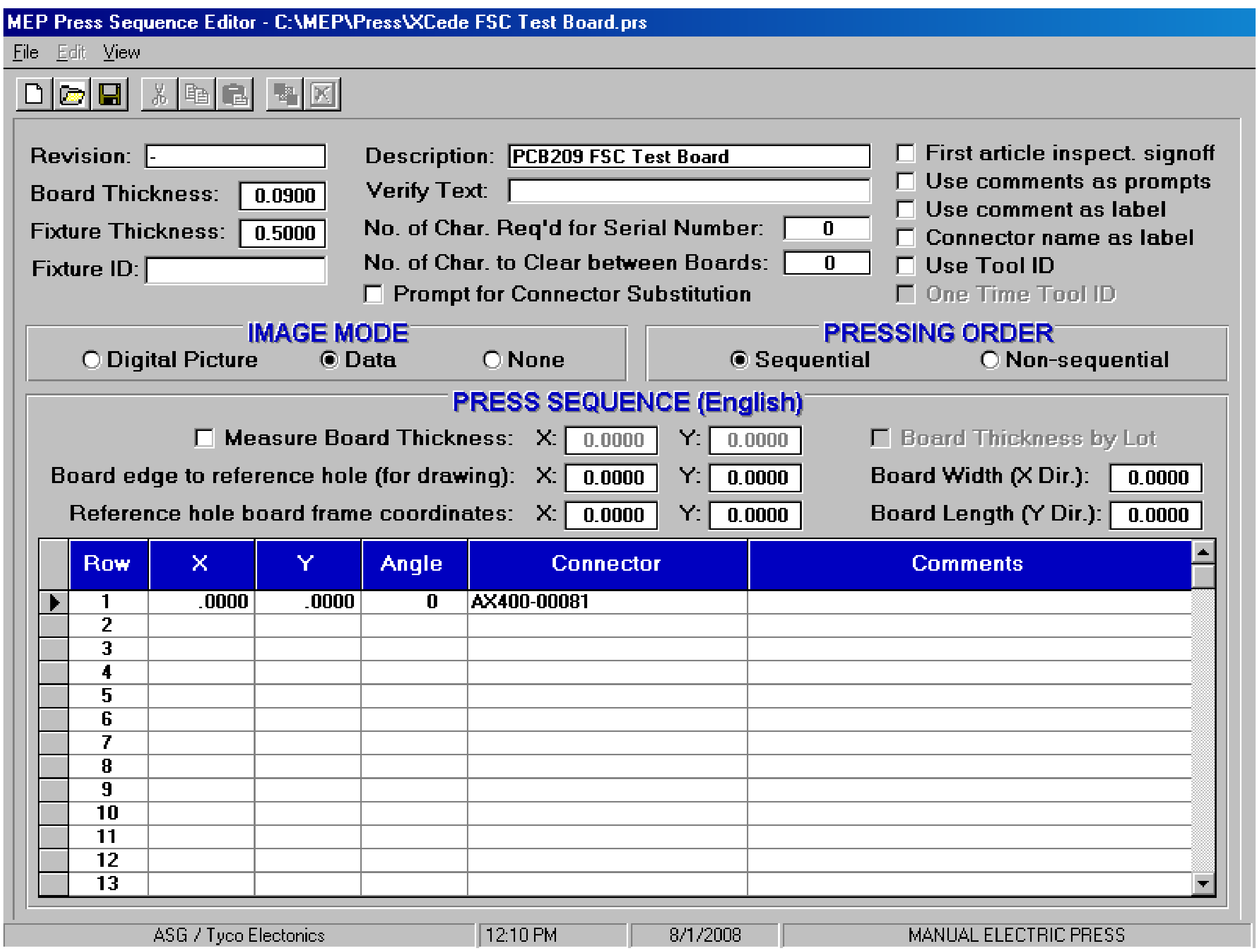

Figure A-7. Press Data Editor of MEP-12T press.

Depending on the PWB thickness and XCede connector being installed, there is compliant pin tail protrusion and / or a connector overhang that must be accounted for using a fixture or pressing pallet. If there is pin protrusion through the under side of the PWB, then the fixture or assembly pallet will require clearance holes consistent with the XCede pin pattern. If the PWB is thicker than the complaint pin protrusion of the XCede connector, then the only requirement is to account for the overhang of the mating face of the XCede connector being installed. Figure A-8 describes how to design a bottom fixture based on pin protrusion and connector overhang by providing these dimensions for each XCede connector type. Figure A-9 shows this requirement pictorially.

XCede Daughter Card PWB + Fixture Thickness Requirements and Compliant Pin Protrusion Lengths				
XCede Connector Type/Size	PWB + Fixture Thickness Minimum (mm)	0.0225" Drill Compliant Pin Protrusion (mm) (negative numbers result in no protrusion)	0.0217" Drill Compliant Pin Protrusion (mm) (negative numbers result in no protrusion)	0.0177" Drill Compliant Pin Protrusion (mm) (negative numbers result in no protrusion)
2-pair	4.5	2.0 – PWB thickness	NA	1.5 – PWB thickness
3-pair	5.0	2.0 – PWB thickness	NA	1.5 – PWB thickness
4-pair	5.0	2.0 – PWB thickness	NA	1.5 – PWB thickness
5-pair	5.0	2.0 – PWB thickness	NA	1.5 – PWB thickness
6-pair	5.0	2.0 – PWB thickness	NA	1.5 – PWB thickness
2-pair RAM	5.4	NA	NA	1.5 – PWB thickness
4-pair RAM	7.5	NA	1.5 - PWB thickness	1.5 – PWB thickness
2-pair EXT RAM	0	NA	NA	1.5 – PWB thickness

Figure A-8. PWB + Fixture dimensions for Press Data Editor setup for MEP-12T press.

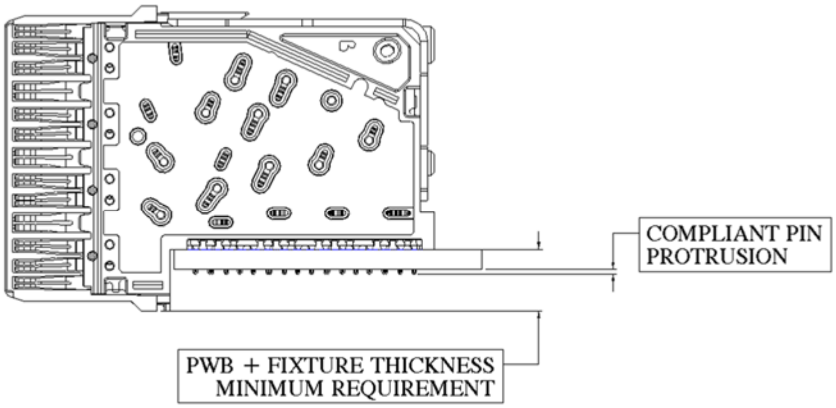

Figure A-9. Detail of PWB + Fixture thickness requirements and compliant pin protrusion of XCede Daughter Card connectors.

The MEP-12T press produces a Force vs. Distance curve during a pressing sequence similar to the one shown in Figure A-10. The main areas of the curve are: the initial compression of the XCede compliant pin and compliance of the PWB hole (1), the point of maximum deflection of the XCede compliant pin (2), the sliding of the compliant pin in the PWB hole (3), and the termination force of the pressing sequence at the 75 Degree Force Gradient line (4). The following descriptions of these areas as for reference and are intended as an aid in understanding the pressing characteristics of the XCede connector utilizing the *ATCS_STD_FG_DWELL.prf* profile.

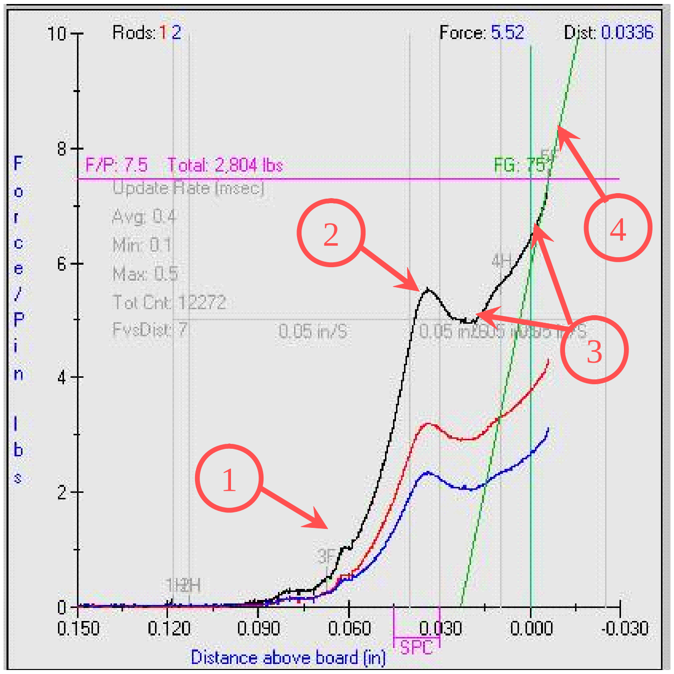

Figure A-10. Typical Force vs. Distance Curve of MEP-12T press for XCede connectors.

1 – Initial Compression of XCede compliant Pins:
Part of the initial pressing sequence with the *ATCS_STD_FG_DWELL.prf* profile (Refer to Figure A-6) is to permit settling and alignment of all the compliant pins of the connector prior to a full pressing sequence. In this zone, the XCede compliant pins and the PWB plated through holes begin to conform to each other and the XCede complaint pins begin to compress. At this zone the slope of the force gradient line begins to increase as the XCede compliant pins continue to compress.

2 – Full collapse of the XCede compliant pin:
At approximately 0.050 to 0.070 inches of insertion into the PWB plated through hole (approximately at the 0.035 inches mark on X axis of the Force Gradient Curve), the XCede compliant pin is fully collapsed in the PWB plated through hole. This is represented by the peak in the force gradient curve, referred to the knee of the curve. Depending on multiple variables including PWB surface finish, PWB hole diameter, compliant pin feature size, number of power pins vs. signal pins, etc., the knee will be more or less pronounced, but is typically highlighted by an inflection point in the curve as Figure A-11 shows.

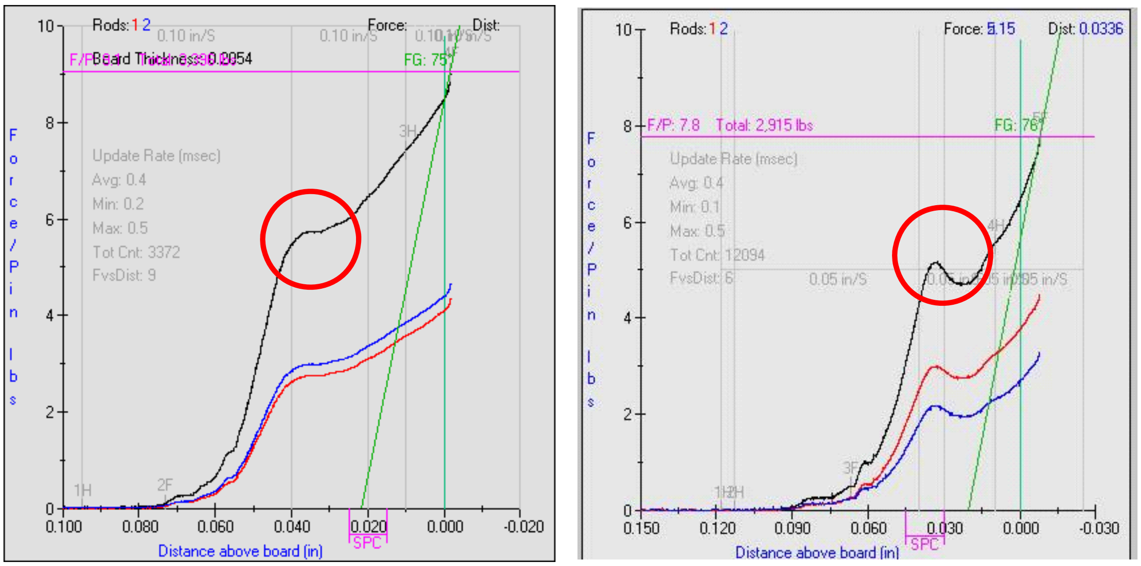

Figure A-11. XCede pressing Force vs. Distance Graph showing two shapes of the knee area utilizing an MEP-12T press.

3 – Sliding Force of the XCede compliant pin in the PCB hole:
After the compliant pin of the XCede connector is fully compressed, the pin travels further into the PWB plated through hole. As this sliding occurs, the force required to continue the installation process of the XCede connector past this point may decrease between 1 and 10 percent for a short distance before beginning to increase again as the compliant pin travels further into the PWB plated through hole. The specific amount of decrease depends on multiple variables including PWB surface finish, PWB hole diameter, compliant pin feature size, number of power pins vs. signal pins, etc. Figure A-11 shows a typical Force vs. Distance curve where the graph on the left does not show a decrease in force during the pressing process, where the graph on the right shows a slight decrease in the force. Both conditions produce a properly installed XCede connector.

Figure A-12 shows that between 0.040 inches and 0.010 inches above the PWB surface (spanning zones 2 and 3, refer to Figure 20), the *ATCS_STD_FG_DWELL.prf* profile searches for the "Max Force Per Pin" value entered in the Connector Editor Tool (Refer to Figure 14). If this force is seen by the MEP-12T press in this region, the press will stop and display an error that the Max Force Per Pin has been reached. If the MEP-12T press does not see the "Max Force Per Pin", the *ATCS_STD_FG_DWELL.prf* profile will move to the next phase of the pressing process; the "75 Degree Force Gradient Line".

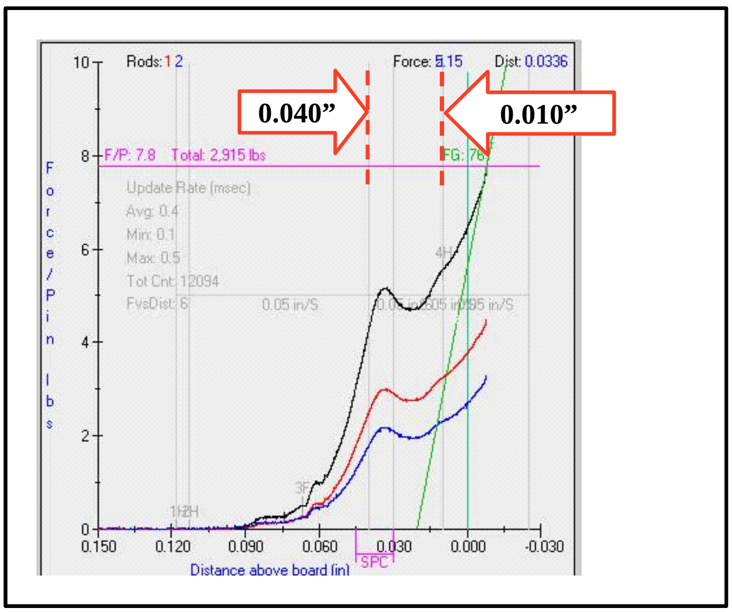

Figure A-12. Force vs. Distance Graph showing the "Max Force Per Pin" zone.

4 – Termination Force at the 75 Degree Force Gradient Line:
Once the XCede connector standoff features begin to come in contact with the PWB surface, the force vs. distance curve will begin to further increase in slope. During this stage of the pressing sequence, the *ATCS_STD_FG_DWELL.prf* profile is designed to begin to search for the force vs. gradient curve to reach a 75 degree angle at a distance from 0.010 inches above to 0.025 inches below the PWB surface (See Profile Editor and Press Data Editor Sections). Once the connector standoff features come in contact with the PWB surface, the connector is fully seated (flush to 0.25 mm above PWB surface, refer to Figure A-9). Figure A-13 shows the termination phase of the pressing process area on the Force Gradient curve.

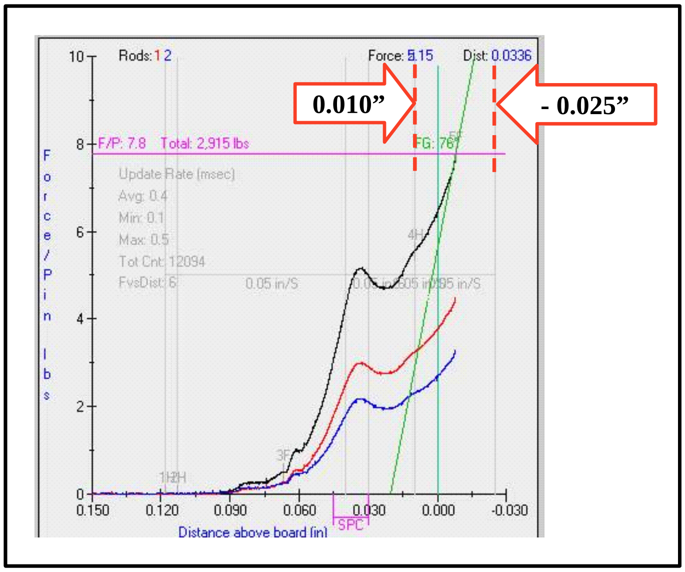

Figure A-13. Force vs. Distance Graph showing the 75 Degree Force Gradient Zone.

The termination force generated by the pressing sequence is a combination of the frictional sliding forces created by the XCede complaint pins and the PWB plated through hole along with other reactionary forces such as complaint pin alignment during the pressing process, connector standoff interference with the PWB surface, PWB and fixture warping, etc. It is important to understand that the termination force of a connector is not equivalent to the force experienced strictly by the connector complaint pin or PWB plated through holes. As a result of the components and process variables associated with the installation of XCede onto PWBs, termination forces of XCede connectors can be expected to be as high or higher than the knee of the curve described within zone 2 (Refer to Figure A-11).