customer manual

ORIGINAL INSTRUCTIONS

customer manual

SAFETY PRECAUTIONS — AVOID INJURY — READ THIS FIRST!

Safeguards are designed into this application equipment to protect operators and maintenance personnel from most hazards during equipment operation. However, certain safety precautions must be taken by the operator and repair personnel to avoid personal injury, as well as damage to the equipment. For best results, application equipment must be operated in a dry, dust-free environment. Do not operate equipment in a gaseous or hazardous environment.

Carefully observe the following safety precautions before and during operation of the equipment:

Always wear approved eye protection while operating equipment.

Moving parts can crush and cut. Always keep guard(s) in place during normal operation.

Always insert customer-supplied optional power plug into a grounded receptacle to avoid electrical shock.

Electrical shock hazard.

Observe main electric on/off switch.

Always turn off the main power switch and disconnect the power source when performing repair or maintenance on the equipment.

Ensure that guards are in place and secure to equipment.

Do not operate the equipment without guards in place.

Always disconnect air supply and then exhaust system air pressure before performing maintenance or repair on the equipment.

Use caution when working with this equipment.

Never insert hands into installed equipment.
Never wear loose clothing or jewelry that may catch in moving parts of the equipment.

Never alter, modify, or misuse the equipment.

Never stare at the bright light used for machine lighting. Bright light can damage the eye.

Never use the machine for other than what it is designed, which is pressing connectors to wire. Do not use the machine for crushing any items.

IMPORTANT SAFETY INFORMATION

NOTE
Keep all decals clean and legible and replace them when necessary.

DANGER
FIRE HAZARD
Do not use solvents or flammable liquids to clean the machine. Solvents or flammable liquids could ignite and cause serious injury or property damage.

Failure to heed these warnings could result in severe injury from harmful fumes or burns from flying debris.

CAUTION
Do not perform any service or maintenance other than as described in this manual. Injury or damage to the machine may result. Failure to observe these precautions may result in injury or property damage.

SUPPORT CENTER

CALL TOLL FREE 1-800-522-6752 (CONTINENTAL UNITED STATES AND PUERTO RICO ONLY)

The **Support Center** offers a means of providing technical assistance when required. In addition, Field Service Specialists are available to provide assistance in the adjustment or repair of the application equipment when problems arise which your maintenance personnel are unable to correct.

INFORMATION REQUIRED WHEN CONTACTING THE SUPPORT CENTER

When calling the Support Center regarding service to equipment, it is suggested that a person familiar with the device be present with a copy of the manual (and drawings) to receive instructions. Many difficulties can be avoided in this manner.

When calling the Support Center, be ready with the following information:

1. Customer name
2. Customer address
3. Person to contact (name, title, telephone number, and extension)
4. Person calling
5. Equipment number (and serial number if applicable)
6. Product part number (and serial number if applicable)
7. Urgency of request
8. Nature of problem
9. Description of inoperative component(s)
10. Additional information/comments that may be helpful.

Figure 1

1. INTRODUCTION

When reading this manual, pay particular attention to DANGER, CAUTION, and NOTE statements.

DANGER
Denotes an imminent hazard that may result in moderate or severe injury.

CAUTION
Denotes a condition that may result in product or equipment damage.

NOTE
Highlights special or important information.

NOTE
Dimensions in this customer manual are in metric units [with U.S. customary units in brackets]. Figures are not drawn to scale.

This manual contains the installation, safety, operation, and maintenance procedures for the C*x*P press machines. This includes the Connector Benchtop Press (CBP-5T Mk II), Connector Manual Presses (CBP-5T Mk II with stand 1-2216056-1/2), Connector Manual Presses (CMP-5T Mk II and CMP-10T Mk II) and Connector Shuttle Press (CSP-5T Mk II). The information provided applies to all C*x*P presses, except where specified as applicable to certain models.

2. SAFETY

The C*x*P is designed to comply with the latest safety standards required by OSHA, NFPA-79 and CSA. In addition, all machines conform to the current CE requirements.

2.1. Electrical

A. CBP/CSP

Appropriate machine grounding is critical for safe operation. Therefore, an external copper ground conductor with a minimum cross section of 2 mm^2, must be connected to the machine's PE point. This is located on the right-side frame and is labeled with "PE". Be aware that electrical hazards exist where labeled.

The main power disconnect switch with "lock-out" function is provided on the right side of the machine and is clearly marked.

B. CMP

Due to power line filter components the leakage current is higher than 10mA. Therefore, a threaded bolt is fixed to the machine frame and labeled with a ground symbol. A separate additional ground line has to be connected to that point. The wire cross section must be at least 10 mm^2.

The main power disconnect switch is provided in the rear panel of the machine and is clearly marked. When it is in the "ON" position, it is mechanically interlocked to prevent the access door from being opened. When it is in the "OFF" position, the switch may be locked in position by inserting a padlock into one of the three locking locations (see Figure 2). In addition to the mechanical interlock, the door is equipped with a keyed lock.

Lock Out/Tag Out

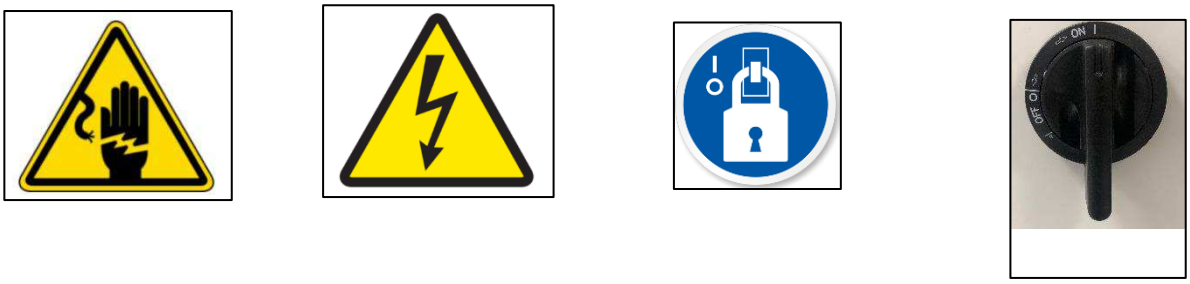

Figure 2

2.2. Eye/Ear Protection

Eye protection should be worn at all times when operating or servicing this machine. In the event a connector is crushed during the pressing operation, pieces of the connector could become airborne. **NOTE**: The laser sensor does not require eye protection use (see Figure 3).

No ear protection is required. Emission sound pressure level at workstation does not exceed 70 dB(A).

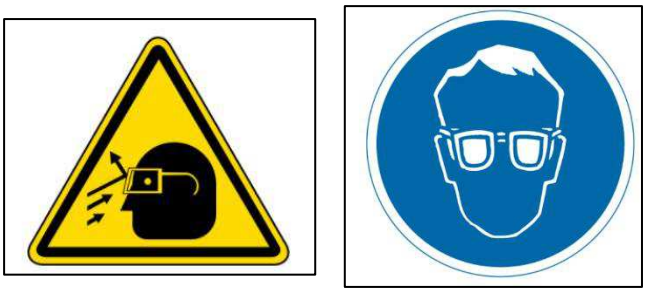

Figure 3

2.3. Safety Covers/Guards

All safety guards must be in place before operating the press. This includes all sheet metal and Lexan panels around the machine (see Figure 4).

Figure 4

2.4. Emergency Machine Off (EMO) / ESTOP

The Emergency Machine-Off (EMO) circuit controller monitors the safety interlocks (see interlock information below) and the computer to decide if it is safe to allow motor power and movement. When the EMO circuit is de-energized, the motor servo controller is disabled, and power is cut off from the motor.

With all of the safety interlocks correctly set, the EMO circuit will energize when signaled by the computer. An interruption by any interlock will de-energize the EMO circuit. **NOTE**: Resetting an interlock will not automatically re-energize the EMO circuit.

2.5. Emergency Stop Interlocks

The Emergency Stop switches are mounted on the lower left and lower right front corners of the press. Though they are clearly visible, an operator should purposely note their position and understand their operation in case of an emergency. Pressing either switch de-energizes the EMO circuit and motion is halted. When pressed, the switch latches in the pressed state and must be turned to be released.

2.6. Light Curtain Interlock

The Light Curtain is a secondary operator safety device. When the light curtain senses an obstruction, the EMO circuit is de-energized, and motion is halted. The interlock automatically resets when it is clear of obstructions (though the EMO circuit will remain de-energized.)

2.7. Pneumatic System

The pneumatic system is provided for the optional air bearing table that allows floating a PCB support fixture for ease of positioning beneath the Press head. On the CMP, the pneumatic system also provides air to the air bearing that floats the head for side to side adjustment. There are no special precautions required for pneumatic system considerations.

2.8. CMP Only

The following safety items apply only to CMP models.

A. Caster Wheels

The CMP is mounted on four swivel casters. The rear two casters are lockable. Two people are required when moving the machine as it is heavy.

B. Seismic Restraints

Protection from unwanted motion during an earthquake can be achieved by bolting the frame to the floor. This can be done in many ways, two of which are described here.

1. Drill holes through the lower frame tube on the right and left sides of the machine. Secure Eye-Bolts to the holes. Anchor similar Eye-Bolts into the floor below the machine. Secure the machine to the floor using chain or cable.
2. Fabricate steel angle plates to bolt to the lower frame tube at the left and right sides of the machine. Anchor the angle plates to the floor.

NOTE
A seismic restraint kit is available from TE upon request.

C. Frame Construction and Weight Distribution

The frame is constructed of tubular steel welded together and supports the very heavy press frame.

NOTE: CMP-10T Mk II shown, CMP-5T Mk II similar

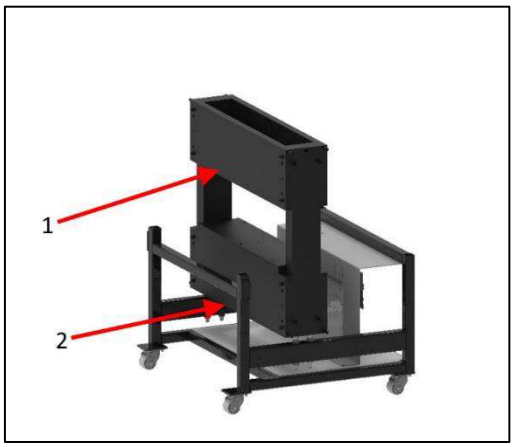

Figure 5

1	Top Horizontal Frame Plates, Preferred Fork Lifting Point
2	Bottom Frame, Alternate Fork Lifting Point

3. INSTALLATION

This section describes the installation steps and requirements for CBP, CSP, and CMP presses.

3.1. CBP INSTALLATION

A. Uncrating

The press, monitor, leveling feet, and other removed parts are shipped on one pallet, which is shrink-wrapped for protection. Remove the shrink-wrap and unpack the monitor and other shipped parts. Remove Press from pallet by unbolting hold-down bolts on four legs and lifting up with a forklift or hoist. Put the fork lift legs underneath either side of the head assembly. See arrows below in Figure 6. The fork lift legs should be wrapped with plastic or wood in hopes to not harm the back windows of the machine.

NOTE
Lift from bottom of structure. Keep forks spread as wide as possible for better stability.

B. Initial Assembly

1. Using the four supplied Foot Levelers (PN 2256177-1), install the four Levelers to bottom of Press and adjust X / Y axis of tabletop level with a 'bubble' gauge.

Figure 6

2. Install customer-supplied 3-conductor power cord appropriate for the available voltage and current capacity (200-240VAC, single phase, 6A) on back of CBP.
3. Route customer supplied 3-conductor power cord through the strain relief on the side of the Press. Connect ground conductor to stud marked "PE" on the side of the Press frame. Connect line conductors to Master Power Switch terminals.
4. Install customer-supplied industrial airline to 'Quick Disconnect' on optional Air Table foot switch, if applicable.

5. If the head *will never* move from left to right, then install the monitor on the shelf. Avoid hitting the pivot handle (see Figure 7). If the head *will* be moving, then place the monitor on the tabletop next to the machine. This way, the pivot handle can be easily reached and moved as necessary.

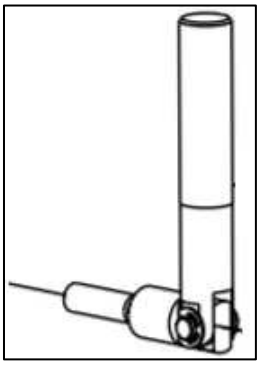

Figure 7

6. Reinstall monitor power cord and monitor video cable.
7. Place keyboard and mouse in keyboard tray and connect to the UI computer on the electrical panel.
8. Connect Barcode Reader (if supplied).
9. Remove press head lock-down brackets, if installed.
10. Power up press by turning on Master Power Switch. The system will boot to the home screen. The default username *Administrator* has a default password of *administrator*.

NOTE

Administrator (Customer / Owner) should change the initial login password to secure the machine from unauthorized access.

C. Facilities Labeling

The machine part number, serial number, manufacture date, and electrical specification are given on the label on the left side of the machine as shown in Figure 8.

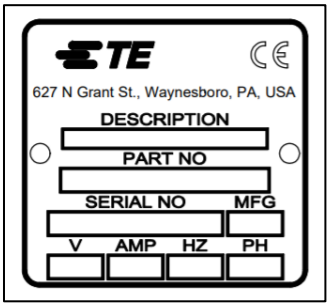

Figure 8

D. Electric Supply Circuit

Electrical supply circuit must be 200-240VAC, 50/60 Hz, single phase.

E. Pneumatic Supply

The pneumatic supply must be connected to the port provided in the Foot Switch. Compressed air is used only for the optional Air Table. Air consumption is minimal. Pressure for the Air Table should be set to the minimum necessary to “float” the PCB fixture used.

3.2. CSP & CBP with Stand 1-2216056-1/2 INSTALLATION

Figure 9

A. Uncrating

The press, monitor, leveling feet, casters, and other removed parts are shipped on one pallet, which is shrink- wrapped for protection. Remove the shrink-wrap and unpack the monitor and other shipped parts. Remove Press from pallet by unbolting hold-down bolts on four legs and lifting up with a forklift or hoist. Put the fork lift legs underneath either side of the head assembly. See arrows above in Figure 9. The fork lift legs should be wrapped with plastic or wood in hopes to not harm the back windows of the machine.

NOTE
Lift from bottom of structure. Keep forks spread as wide as possible for better stability.

B. Initial Assembly

1. Using the four supplied Foot Levelers (PN 2256590-1), install the four Levelers to bottom of Press and adjust X / Y axis of table top level with a 'bubble' gauge.
2. Install four supplied casters (PN 2256386-1) to bottom of frame.
3. Install customer-supplied 3-conductor power cord appropriate for the available voltage and current capacity (200-240VAC, single phase, 6A) on back of CSP.
4. Route customer supplied 3-conductor power cord through the strain relief on the side of the Press. Connect ground conductor to stud marked "PE" on the side of the Press frame. Connect line conductors to Master Power Switch terminals.
5. Install customer-supplied industrial airline to 'Quick Disconnect' on lower panel of machine. Air at 80PSI is required for pneumatic shuttle.
6. Install monitor on the shelf. Reinstall monitor power cord and monitor video cable.
7. Place keyboard and mouse in keyboard tray and connect to the UI computer on the electrical panel.
8. Connect Barcode Reader (if supplied).
9. DO NOT remove press head lockdown brackets.
10. Power up Press by turning on Master Power Switch. The system will boot to the home screen. The default username *Administrator* has a default password of *administrator*.

NOTE
Administrator (Customer / Owner) should change the initial login password to secure the machine from unauthorized access.

C. Facilities Labeling

The machine part number, serial number, manufacture date, and electrical specification are given on the label on the left side of the machine as shown in Figure 10.

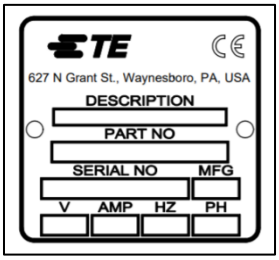

Figure 10

D. Electric Supply Circuit

Electrical supply circuit must be 200-240VAC, 50/60Hz, single phase.

E. Pneumatic Supply

The pneumatic supply must be connected to the port provided in the machine base. Compressed air is used to operate the pneumatic shuttle. Air consumption is minimal. Pressure for the pneumatic shuttle should be set to the 80PSI.

3.3. CMP INSTALLATION

A. Uncrating / Lifting

The press, monitor, leveling feet, and other removed parts are shipped on one pallet and are shrink-wrapped for protection. Remove the shrink-wrap and unpack the monitor, computer and other shipped parts. Remove press from pallet by unbolting hold-down bolts on four legs and lifting up several inches with a forklift. Use “2x4” or equivalent wood blocking between underside of Top Horizontal Frame Plates (see Figure 5) and forklift blades. Alternately, the machine may be lifted by lifting on the bottom frame cross members (see Figure 5). In either case, keep forks spread as wide as possible for better stability.

B. Initial Assembly

1. Using the four supplied M8 x 12 long socket head screws (PN 6-1655316-7) per wheel, install the four Caster Wheels (2256047-1) to bottom of Press Frame (2216143-7).
2. Install customer supplied 3-conductor power cord appropriate for the available voltage and current capacity (200-240VAC, single phase, 10A) by routing it through right-angle cable gland (located on the left side panel of the machine. On the inside of the machine, route cable up. Terminate ground wire to PE ground stud on machine frame. Terminate phase wires to the enclosed main power disconnect switch (see Figure 11).

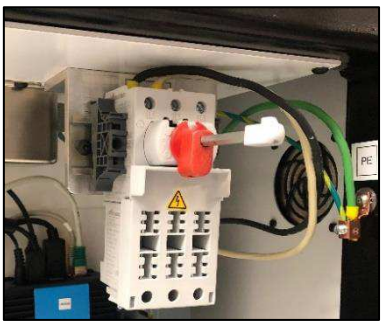

Figure 11

3. Install customer-supplied industrial airline to ‘Quick Disconnect’ input on lower back side of Press. Verify that shop air input has a minimum of 552 kPa [80 psi] to CMP Air Regulator.

4. Reattach monitor articulating arm (2216845-1) to the preferred side of the machine. Attach monitor to arm with supplied mounting screws (3-18023-7). Reattach monitor power cord and video cable.
5. Reinstall Barcode Reader (if supplied).
6. Remove Press Head lockdown brackets (one on left side and one on right side).
7. Attach keyboard to UI computer in control cabinet.
8. Attach mouse, keyboard, touchscreen and external USB cables to UI computer in control cabinet.
9. Power up Press by turning on Master Power Switch. The system will boot to the home screen. The default username *Administrator* has a default password of *administrator*.

NOTE
Administrator (Customer / Owner) should change the initial login password to secure the machine from unauthorized access.

C. Facilities Labeling

The machine part number, serial number, manufacture date, and electrical specification are given on the label on the left side of the machine as shown in Figure 12.

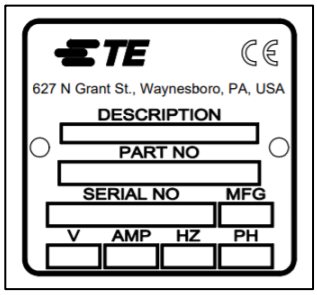

Figure 12

D. Electric Supply Circuit

Refer to the Facilities Labeling on the left side of the machine for exact requirements but in general, the electrical supply circuit must match the following: 200 to 240 VAC, 50/60Hz, 1 phase, 2 wire service. It must be protected by a breaker rated for at least 10,000 IAC.

E. Pneumatic Supply

The pneumatic supply must be connected to the port provided at the lower left corner of the press. Pressure between 552-827 kPa [80-120 psi] is acceptable. Compressed air is used only for the head positioning air bearing and optional Air Table. Air consumption is minimal.

4. MACHINE END OF LIFE CYCLE

A decommissioned machine should be returned to TE Connectivity for proper disposal.

5. PRESS OVERVIEW

This section introduces the CBP, CSP, and CMP presses. They will be collectively referred to in this manual as C*x*P. A brief review of the purpose, capabilities, options, and layout is given.

5.1. Purpose

The C*x*P servo electric press was designed for two primary purposes. First, to satisfy the increasing need for controlled quality pressing of connectors on today's complex circuit boards. As the density of connectors increases, they become more fragile. At the same time, circuit boards have become more complex, susceptible to damage, and costly. This trend will undoubtedly continue and accelerate as interconnect PCB's continue to move from simple passive elements to more complex devices with surface mount devices, and devices buried in the inner layers. In recent years, back panel assembly shops have had to dramatically increase their process.

sophistication. It has become obvious that the old methods of "slamming" the connectors into the board are no longer acceptable. The C*x*P, being an electric servo driven press, precisely controls the force and speed of each pressing cycle. In addition to control, quality feedback in the form of SPC analysis, display, and reports is available for the first time. Valuable data can now be captured and analyzed to improve the entire interconnect process.

The second purpose is to improve the efficiency of the pressing process. The manual techniques traditionally used for pressing connectors have been very labor intensive, unsafe, and ergonomically unacceptable. The result is that the throughput and quality has been operator dependent, which inevitably produces variable results. The electric servo press improves throughput while yielding more consistent computer-controlled results with quality data feedback.

Thus, the dual purpose of this press meets the needs of the assembly shop and the end customer simultaneously.

5.2. **Layout**

Dimension	CBP-5T Mk II	CBP 5T Mk II with Stand 1-2216056-1/2
Width	836 mm [32.9 in.]	836 mm [32.9 in.]
Depth	665 mm [26.2 in.]	665 mm [26.2 in.]
Height	962 mm [37.9 in.]	1775 mm [69.9 in.]

Figure 13

Dimension	CSP 5T Mk II
Width	836 mm [32.9 in.]
Depth	665 mm [26.2 in.]
Height	1775 mm [69.9 in.]

Figure 14

Dimension	CMP-5T Mk II
Width	1205 mm [47.4 in.]*
Depth	1176 mm [46.3 in.]*
Height	1752 mm [69.0 in.]
*Not including monitor	

Figure 15

Dimension	CMP-10T Mk II
Width	1398 mm [55.0 in.]*
Depth	1290 mm [50.8 in.]*
Height	1936 mm [76.2 in.]
*Not including monitor	

Figure 16

5.3. Capabilities

A. CBP Specifics

The CBP delivers a controlled force of up to 44 kN (10,000 lbs) through a 200 mm long X 37 mm wide [7.87 in long X 1.46 in. wide] “flat rock” anvil head. The Z axis travel is 50mm [1.97 in.].

NOTE
A total of 160 mm [6.3 in.] of pressing space is available by installing a 50 mm [1.97 in.] adapter on the anvil. The normal retract position gives 140 mm [5.51 in.] space between the press head and tabletop; 90 mm [3.54 in.] in full extend. The 50 mm [1.97 in.] adapter adjusts the space envelope to 90 mm [3.54 in.] retracted and 40 mm [1.57 in.] extended. The “up” head position can be programmed for any desired tool clearance while pressing. This improves efficiency by limiting the stroke travel per cycle. It can also be very convenient to use the press head as a tool support for unstable tool/connector situations. Additionally, the Press has a Press Head that rotates manually 90° and air bearing capability for a PCB support fixture on the tabletop.

The PCB size limit is 450 mm wide X 700 mm long [17.72 in. wide X 27.56 in. long]. The structure opening width is 550 mm [21.65 in.] and the press head can be moved from side to side on a slide to access the edges of wide boards.

B. CSP Specifics

The CSP delivers a controlled force of up to 44 kN (10,000 lbs) through a 200 mm long X 37 mm wide [7.87 in long X 1.46 in. wide] “flat rock” anvil head. The Z axis travel is 50mm [1.97 in.].

NOTE
A total of 160 mm [6.3 in.] of pressing space is available by installing a 50 mm [1.97 in.] adapter on the anvil. The normal retract position gives 140 mm [5.51 in.] space between the press head and tabletop; 90 mm [3.54 in.] in full extend. The 50 mm [1.97 in.] adapter adjusts the space envelope to 90 mm [3.54 in.] retracted and 40 mm [1.57 in.] extended. The “up” head position can be programmed for any desired tool clearance while pressing. This improves efficiency by limiting the stroke travel per cycle. It can also be very convenient to use the press head as a tool support for unstable tool/connector situations. Additionally, the Press has a Press Head that rotates manually 90° and air bearing capability for a PCB support fixture on the tabletop.

The PCB size limit is 450 mm wide X 700 mm long [17.72 in. wide X 27.56 in. long]. The structure opening width is 550 mm [21.65 in.] and the press head can be moved from side to side on a slide to access the edges of wide boards.

C. CMP Specifics

The CMP delivers a controlled force of up to 44 kN (5 tons/10,000 lbs) for the CMP-5T Mk II or 89 kN (10 tons/20,000 lbs) for the CMP-10T Mk II, through a 212 mm long x 75 mm wide “flat rock” head. The Z axis travel is greater than 125 mm and the “up” position can be programmed for any desired clearance above the tool before pressing. This improves efficiency by limiting the stroke travel per cycle. It can also be very convenient to use the press head as a tool support for unstable tool/connector situations.

The PCB size limit is 610 mm wide x 915 mm deep (CMP-5T Mk II) or 748.5 mm wide x 965.2 mm deep (CMP-10T Mk II). The press head can be moved from side to side to access the edges of wide boards.

D. Precise Control of Pressing

The program for pressing is a simple table of connector types and positions. Each pressing cycle, called a profile, is precisely defined by the user to control force, speed, and distance as the connector is pressed. This highly flexible technique allows a virtually unlimited variety of pressing options to satisfy the needs of present and future connectors. Data describing the connectors, tools, PCB, and pressing profile are stored in databases that can be modified either on or off line.

Many useful features and utilities are provided for maintenance. This includes on-screen display of all machine inputs, and access to force all outputs.

User-definable I/O is available via a connection on the rear of the machine to remotely control the press by triggering and receiving events.

The pressing process can be controlled in one of five ways:

1. **FIXED FORCE -** A connector can be pressed to a set force, such as 5 kN [.56 tons/1,124 lbs]. This is a common technique used by hydraulic and pneumatic presses. It is the least sophisticated method available and is the most likely to damage the PCB or connector.
2. **FIXED FORCE PER PIN -** A connector can be pressed to a set force per pin, such as 150 N [33.7 lbf] per pin. This is slightly better than the first method because it recognizes that the force applied should be proportional to the number of pins being pressed. It cannot, however, compensate for normal variations in required force per pin for different connectors, in different positions, in different boards.
3. **PRESS TO HEIGHT –** A connector can be pressed to within a programmed distance short of seating on the board surface. This is the gentlest process possible because it exerts only enough force to press the pins into the board. No excess force is pressed into the connector plastic or the board. This sophisticated technique is made possible by the control available using an electric servo press head and a rigid press structure. In order for press to height to be accurate, the board thickness must be precisely known. This can be done using the thickness measurement probe and sequence provided.
4. **(PARS) – PERCENT ABOVE RANGE SAMPLE –** A connector can be pressed with force that is proportional to the actual resisting force detected during the pressing cycle. We call this Percent Above Range Sample, or PARS. In this technique, the connector's resisting force while pressing is sampled and averaged over a distance range above final seating to the board surface. The final force percent added assures complete seating of the connector. This is the most widely used technique because it limits the stress to the assembly but does not require great accuracy for board thickness measurement.
5. **FORCE GRADIENT –** Monitors the rate of change of force to distance. This method is used for robust connectors that need to be seated against the board surface. Generally, the force vs. distance plot will make a steep upturn as the connector contacts the board surface. The connector stops moving so the force rises quickly.

   A minimum slope is specified for the upturn in terms of ΔForce over ΔDistance, which corresponds to how solidly the connector is pressed against the board. A conversion tool is provided for those accustomed to using the legacy force gradient programming method, which uses the production graph scaling and graph gradient angle.

E. Board Thickness Measurement

Board thickness measurement facilitates the press to height technique by measuring the actual thickness of the PCB before the pressing cycle starts. If the board thickness is not measured, the program uses a nominal thickness in height calculations.

5.4. Optional Accessories

A. ACAL (Automatic Calibration) Unit

There are two different units, one for a 5T machine and one for a 10T. They are used to recalibrate the machine, which must be done annually. This accessory is bought so the company can calibrate the machine on their own.

B. Bar Code Reader

The bar code reader option allows PCB serial numbers to be quickly entered for tracking purposes.

Pressing tools can also identified by bar code for efficient and accurate control. Tool identification can be enabled by adding the Tool ID condition to the press sequence.

C. CBP MKII SensiPress Anvil Extension

This SensiPress option is specific to the CBP MKII machine only. CBP with stand 1-2216056-1/2 Is not included. There are three different dash numbers to associate with the machine height that is bought. The extension is larger than the original received so that the head can get closer to the table top if a smaller product needs to be pressed.

D. CMP Height Extension

The CMP height extension option lifts the machine to a standing height.

From table top to floor with the caster wheels measures 902mm (see Figure 17). This machine should be installed by a field engineer.

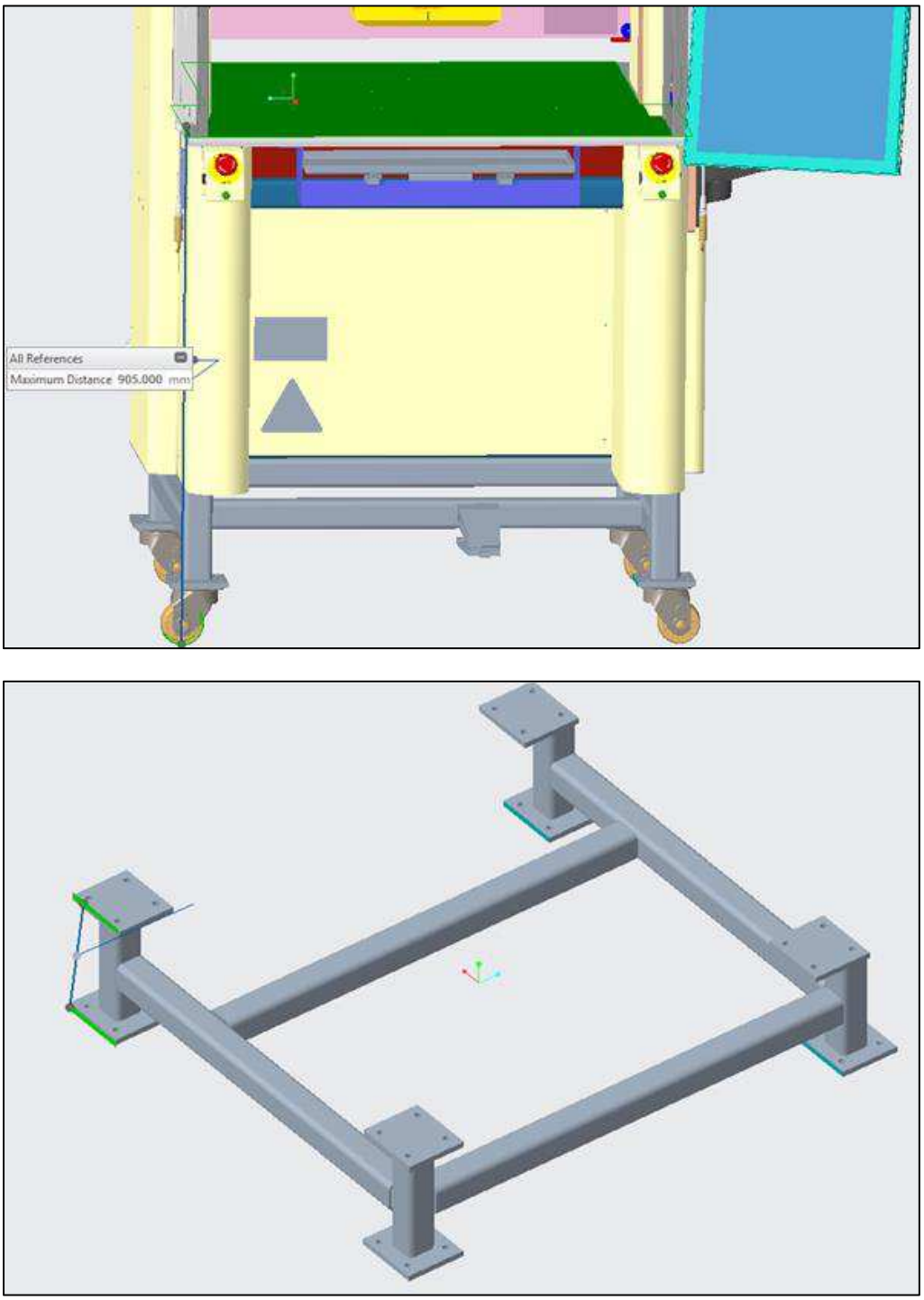

Figure 17

E. CXP Spare Parts Kit

Each CXP machine part number has the option of its own spare parts kit to include extra pieces, such as light curtains or emergency stops. This kit is usually bought so that, if something breaks, it can be repaired right away.

F. Manual or Pneumatic Shuttle

The pneumatic shuttle can only be used on the CSP MKII machine, but the manual shuttle can be put on any of the machine when also buying a different table top. This option is bought mainly to help with ergonomics, so a person does not have to reach so far under the machine.

5.5. Machine Specific Configuration

The main screen is always displayed at startup or when no operator is logged on. Pressing the “TE logo” button at the top left of the screen will also display the main screen.

The configuration of the machine can be viewed by clicking the “System” drop-down menu on the left side of the top navigation bar and selecting *About* from the menu. The machine attributes are given as shown in Figure 18.

Users with administrator access rights can navigate to the System Settings screen and select the Database Backup and Restore tab to manage database versions.

NOTE: CMP About Screen – CBP and CSP Similar

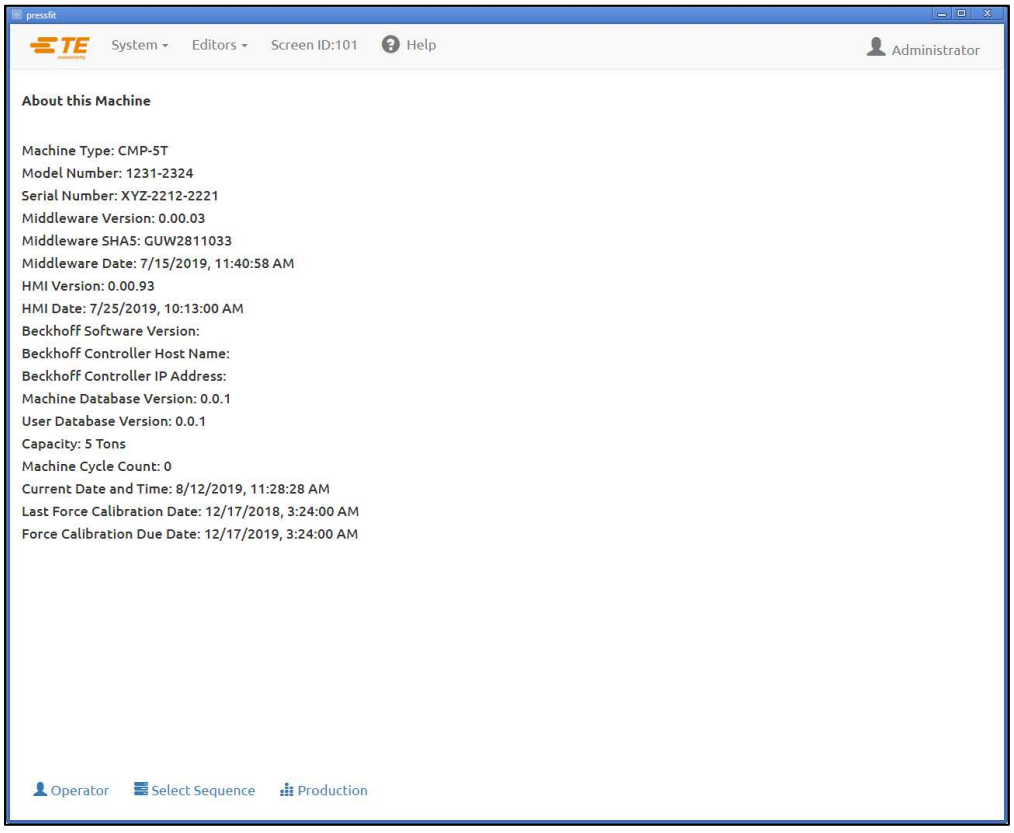

Figure 18

6. OPERATION (PRODUCTION)

6.1. Getting Started

This startup procedure assumes all necessary information has been entered in the Tool Database, Connector Database, Profile Database, Condition Database, and Sequence Database. See the programming section for details on entering data into these database tables. CBP screen examples are shown below. CMP screens are similar.

6.2. Operator Interface

All selections on the computer monitor can be made either by touching the screen with a finger or by pointing and left clicking with the mouse. Alpha-numeric entries can be entered by the keyboard or by touching the screen buttons provided. Data for some production screen entry fields can also be entered using the optional barcode scanner. **NOTE**: A drop of moisture on the face of the touch screen may prevent normal operation until it is removed.

Navigation between the primary functional screens is accomplished using the operator button toolbar along the bottom of the screen and the drop-down menus located in toolbar at the top of the screen. The operator toolbar along the bottom of screen contains buttons that link to the primary screens used by an operator during production. The System drop-down menu located along the top toolbar contains buttons that link to the screens used for system setup and maintenance. The Editors drop-down menu located along the top toolbar contains buttons that link to the screens used for part and sequence setup (see Figure 19).

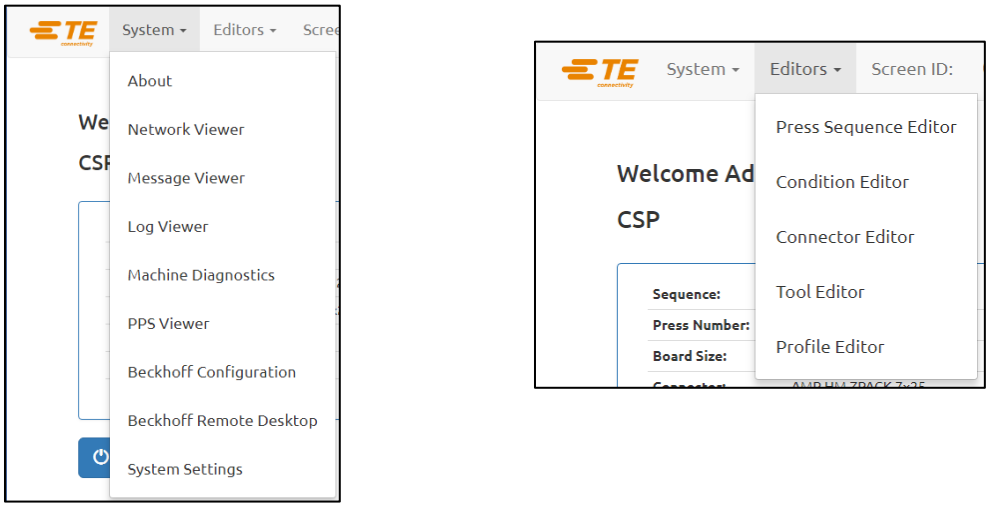

Figure 19

Certain screens and/or specific function buttons may not be available, depending on the user's access level. See the User Access section for more information. Press the "Help" button on the top toolbar to view information from the user manual.

During production pressing operation, only a single toolbar is displayed at the bottom of the screen. The buttons on this toolbar provide access to the functions available during board processing. Some function buttons may not be available, depending on the user's access level (see Figure 20).

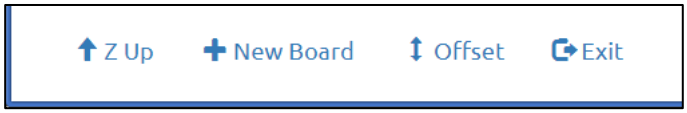

Figure 20

6.3. Powering Up

The main power disconnect is mounted on the side (CBP) or rear (CMP) of the machine. Turning the switch to the "OFF" position disconnects the incoming power. It can be locked out for safety and security proposes. Turn it to the "ON" position to start the machine.

6.4. Logging In

When the program is started, the main startup screen is displayed. The user will need to log in on the Operator screen prior to navigating to any other screens. Select the Operator button (see Figure 21 left) in the lower toolbar or the Operator icon (see Figure 21 right) on the right side of the upper toolbar to display the Operator screen. Attempting to navigate to another screen prior to logging in will redirect the user to the Operator screen automatically. Once the user has successfully logged in, the user will be automatically taken to the screen he or she was previously attempting to access (see Figure 22).

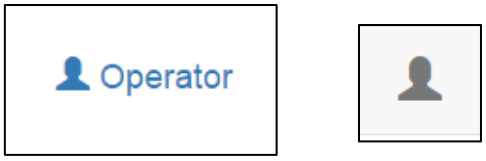

Figure 21

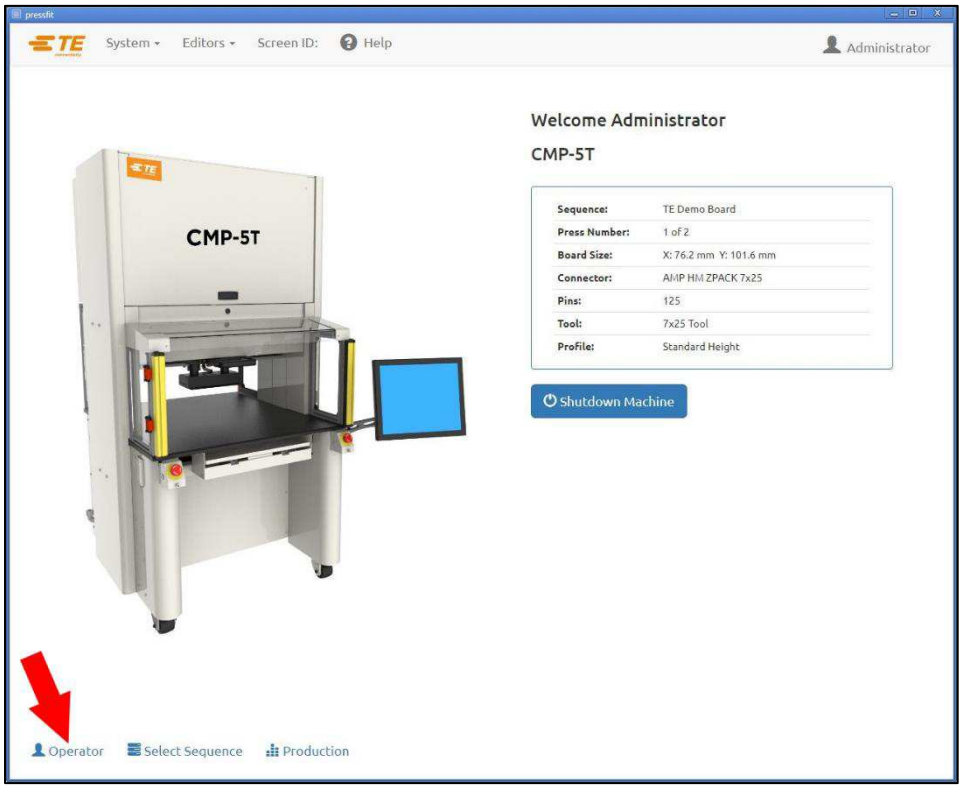

Figure 22

NOTE
Select your name from the drop-down user selection box. If your name does not appear on the list, you must see the system ADMINISTRATOR to have your name added.

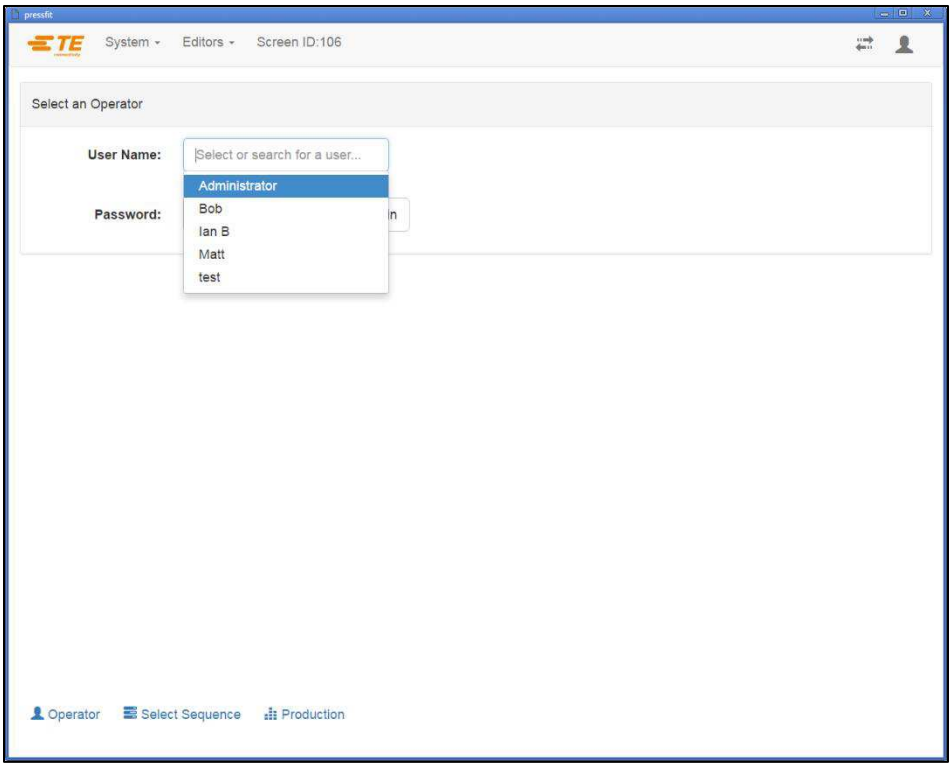

Figure 23

Select the password entry field and enter your password using a physical keyboard or the on-screen keypad. Press “Login“ to validate the user’s credentials and complete the login process (see Figure 24).

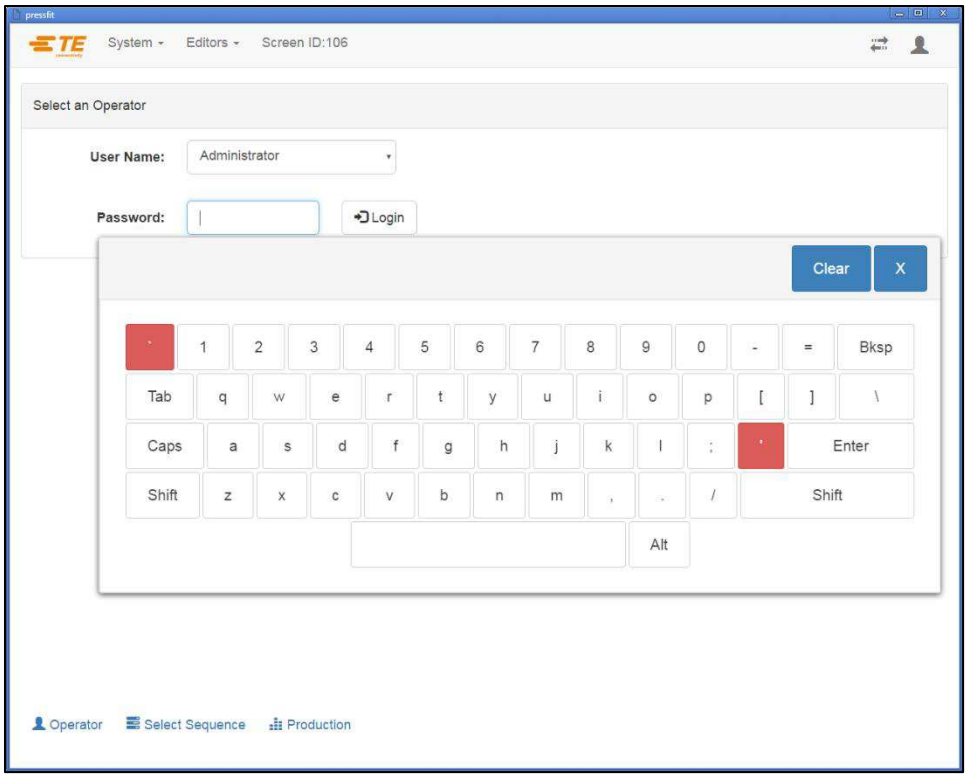

Figure 24

6.5. Selecting the Board

Press the “Select Sequence” button on the lower toolbar (see Figure 25).

Figure 25

Now select the sequence from the list presented. Use the scrollbar on the right side of the list to view the full list of sequences. All available programs are listed alphabetically by case. Select the “Load Sequence” button to load the selected sequence. Once the sequence has been loaded successfully, the user will automatically be taken to the Production screen. Select the “Delete Sequence” button (see Figure 26) to permanently remove a sequence from the database. A dialog window will open prompting the user to verify that still wishes to delete the selected sequence. Selecting the “Delete” button from the confirmation dialog will complete deletion of the sequence.

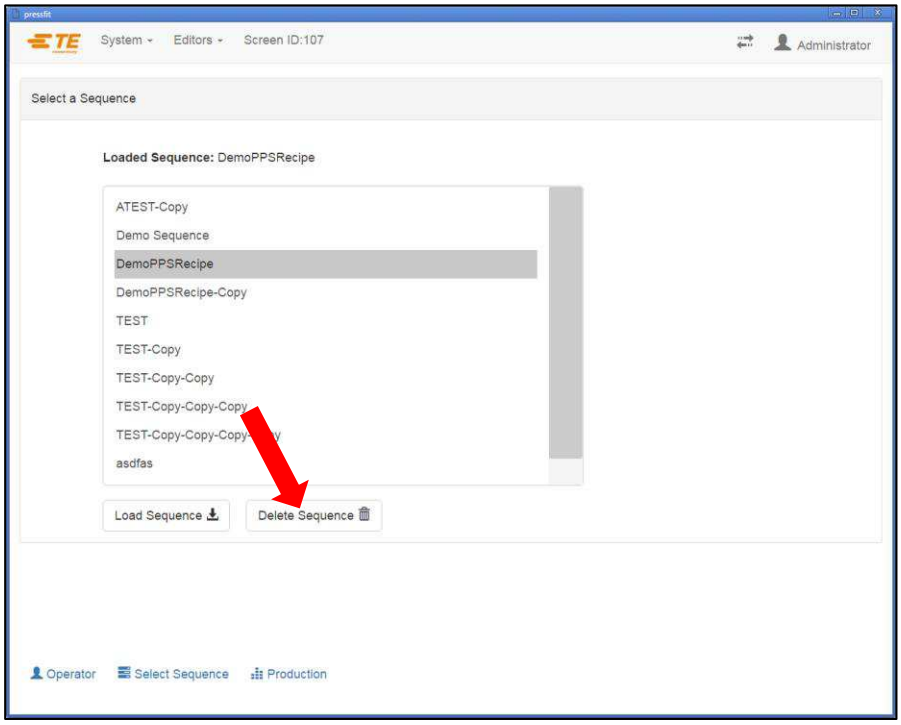

Figure 26

6.6. Running the Board

Click on the “Production” button to enter the runtime production mode (see Figure 27). If the machine axis has not yet been homed, on screen message prompts will guide you through the steps to perform this action. After pressing the on-screen “run” button, the light curtain must remain uninterrupted until the homing process is completed.

Figure 27

The first screen displayed upon entering Run mode will depend on the sequence that has been loaded for the current board. See the “Start Pressing” section for details on information that may be requested before pressing each board.

The run screen will display showing a rendering of the PCB based on the input data on the top left, a blank graph for the pressing force vs. distance data on the top right, a multi-purpose “action” button which contains prompts and status text information in the bottom left, information about the current press sequence and connector in the bottom right, and a toolbar of buttons along the bottom. See the “Programming” section below for details on setting up board sequences and creating connectors and tools in the database.

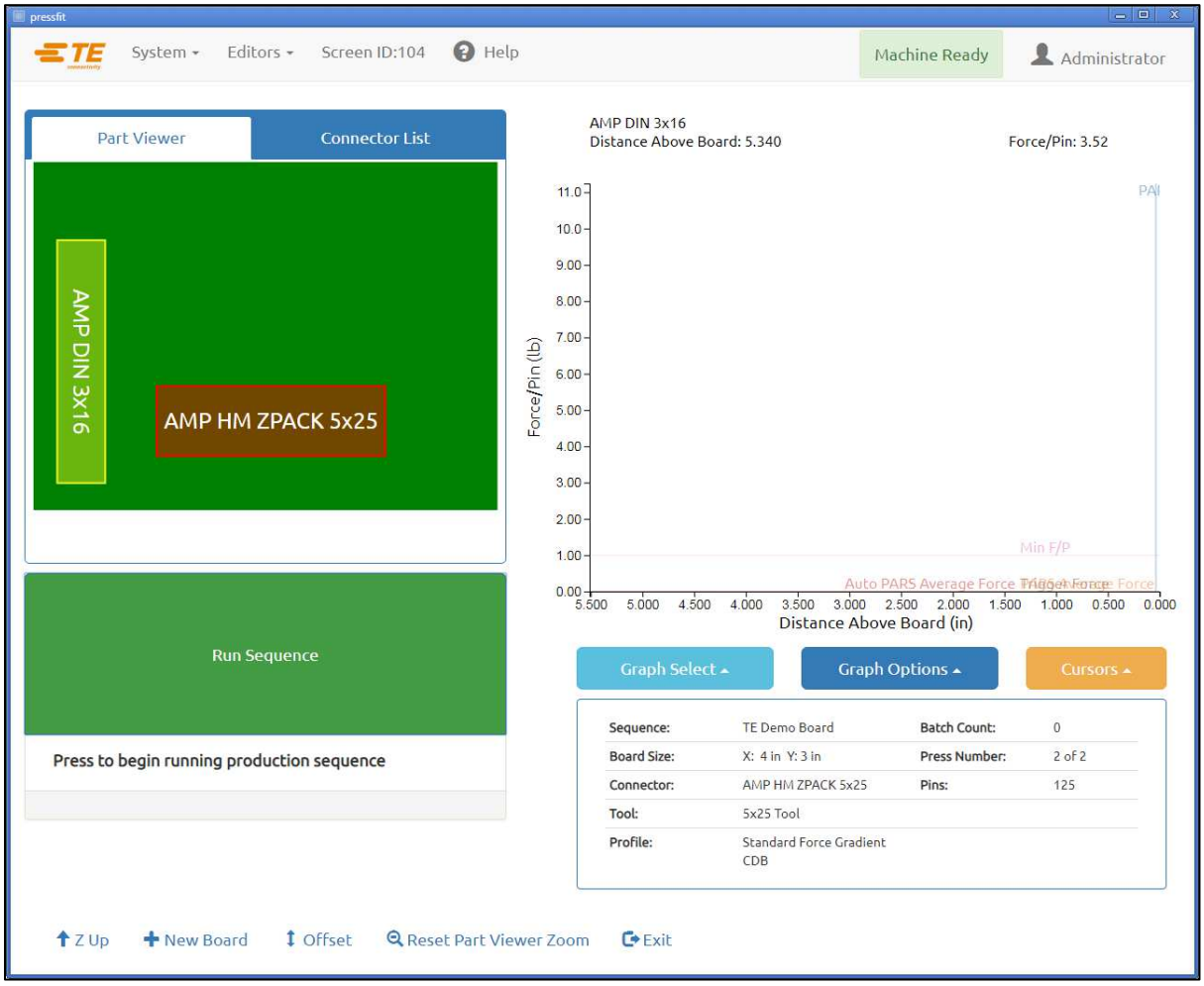

Figure 28

6.7. Run Screen Buttons

Depending on the access level of the person logged in, only some of the buttons may be available. The purpose of each button, from left to right, is as follows:

Z Up: Used to raise the Z axis completely. After pressing this button, the press will move up to its clearance position as long as the light curtain is not broken, and the press does not encounter excessive force.

Goto Function: Used to randomly access any connector on the PCB. Select the desired connector by touching or left- clicking on the connector image in the PCB rendering shown on the left side of the screen. The selected connector will be highlighted in red.

Offsets: Used to change the pressing height. The offset window allows a stored offset to be changed for the *current connector type* on the PCB. Connector Offset is particularly useful in compensating for the many product lot variables encountered when pressing to height. The offset shown when this button is pressed applies to the *next connector* to be pressed in the current sequence. When changing an offset, verify the name of the connector in the info panel in the lower right of the screen to avoid unexpected results. The Offset button may not be available for all users' access levels. Connector offset should only be used to compensate for normal product lot variation, not errors in tool/connector/fixture height data or incorrect profile definitions (see Figure 29).

Reset Part Viewer Zoom: Used to reset the zoom setting on the part viewer panel. This resets the zoom setting, so the full board graphic is displayed.

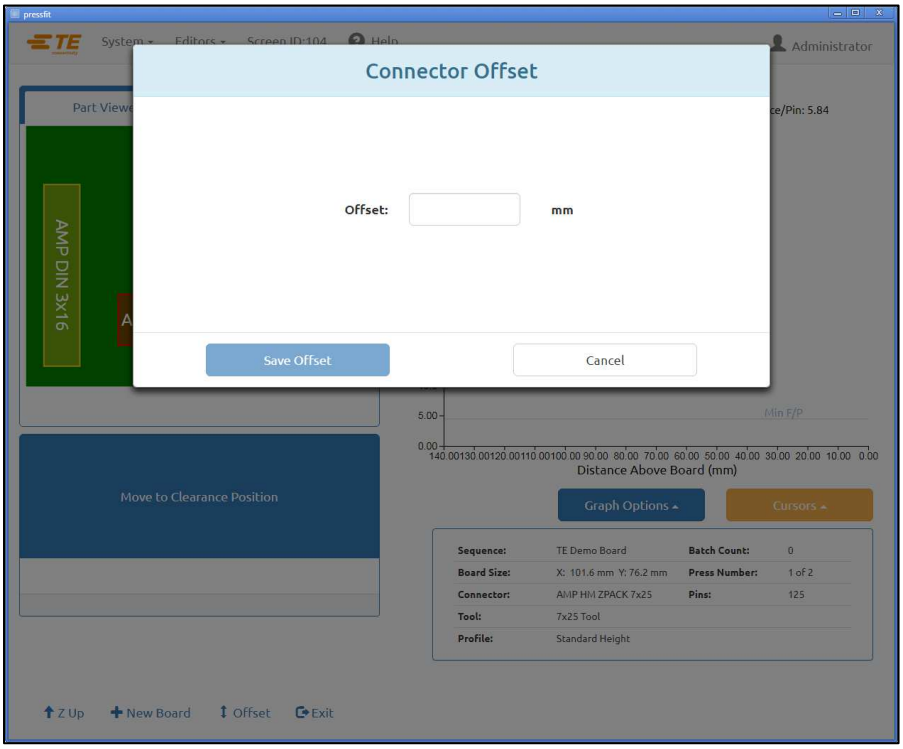

Figure 29

"**New Board**" - Used to reset the sequence pointer to the first connector. The result is the same as touching or pressing connector #1 (If the connector is the first step in the sequence).

"**Exit**" - Used to return to the main screen as displayed on startup. This is usually done at the completion of a press run. From the main screen, a new PCB can be selected, or the operator can log off. Logging off before leaving the machine unattended will prevent unauthorized access.

6.8. On Screen PCB Rendering

The PCB rendering drawn on the screen shows the connector locations relative to each other and the board edges. The rendering is a good check for gross errors when running a new program for the first time. It will be obvious, for example, if a connector is off the board, if there is any interference between connector locations or if connector angles do not match the actual PCB layout (see Figure 30).

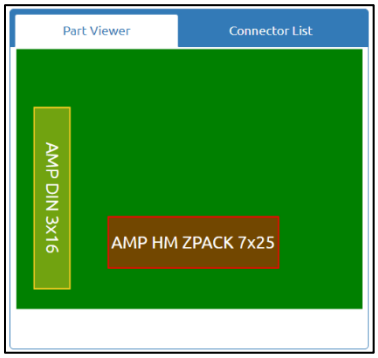

Figure 30

The rendering is shown with the first connector to be pressed highlighted in red. This will be the first connector in the sequence. Connectors are shown as rectangles.

It also shows the connector number, name or message based on the sequence settings. To read the detailed information, zoom in by double-clicking (or double tapping on the touch screen) the rendering using the left mouse button.

6.9. Start Pressing

Each individual sequence is started by pressing “Run Sequence” when prompted. Any sequence steps prior to the first press step will be executed before the operator is prompted to use the button to start the pressing operation. A combination of any, all, or none of these various conditions may be part of a sequence prior to pressing. Required information can be typed from the keyboard, entered via the touch screen, or if the operation is a barcode scanning operation, scanned using the optional bar code scanner.

Connector Substitution - This feature allows for interchangeable connectors, typically from different manufacturers, to be selected at runtime. If any connector on the currently selected board has an alternate and this feature has been checked in the Sequence editor (see the Connector and Sequence Editors for programming of this feature), you will be prompted to make a selection.

PCB Verify - This feature requires verification of the “type” or “model” of the board being run. Ideally, the board will be bar coded with this information, but typing it in will also work. This feature is enabled by adding a “PCB Verify” condition to the Sequence.

PCB Serial Number - This feature requests the serial number for each board. Bar code scanning is the most convenient method to use but the serial number can also be entered from the keyboard or touch screen. For data options, refer to the Press Sequence Editor section. This feature is enabled by adding a “PCB Serial Number” condition to the Sequence (see Figure 31).

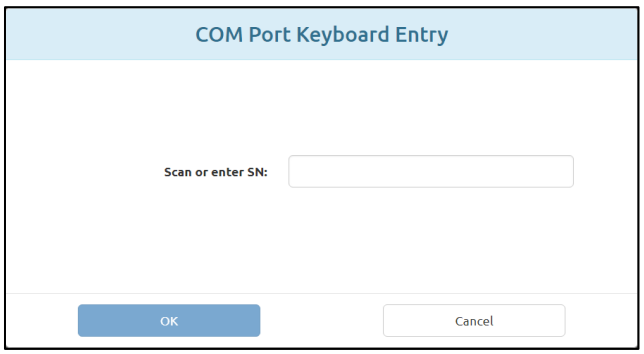

Figure 31

Verify Tool ID - This feature requires the tool identification to be verified before pressing can proceed. It is a quality confirmation that reduces the possibility of a mismatch between what the press expects and what the operator is doing. The ID can be typed in or scanned. This feature is enabled by adding a “Verify Tool ID” condition to the Sequence.

6.10. User Signoff

If this feature is activated, the press will stop after the first board is completed and will not continue until sign off has been performed. This featured is enabled by adding a “User Sign Off” condition to the Press Sequence.

6.11. Changing the Pressing Sequence

The next connector to be pressed can be changed after a cycle has been completed or interrupted. Using the mouse pointer or a finger on the touch screen, select the connector to be pressed next. The sequence will continue from the new point and will automatically step to the next connector or condition in the program sequence. If the board program specifies Non-Sequential mode (refer to the Press Sequence Editor section), the press will remain on the current connector position (or board thickness measurement) until another connector is selected. This mode is primarily used for PCB repair activities.

6.12. Profile Error Conditions Related to the Board, Connector, Tools, and Programs

Some of the more common profile error conditions encountered during pressing are detailed below. The error conditions generated by the Profile program are user defined, so the wording may vary. The profile programmer may also define other error messages.

Premature Contact - This is likely to be the most common profile error encountered during normal operation. It occurs when the press head makes contact with the tool before expected. The contact force and position thresholds are defined in the Profile for the connector. Here are some of the possible causes:

- The connector is tilted so it is sitting too high.
- The pressing tool is raised on the connector by a bent pin.
- The connector is raised above the PCB by a bent pin that prevents all pins from entering the holes.
- The connector below the head is not the one expected (the PCB is in the wrong position)
- There is an error in the Press Profile file (*.prs) such that the head contacts the tool before expected.
- An incorrect board or fixture thickness is called out in the Press Data file (*.pdf)
- An incorrect tool height is called out in the tool database.
- An incorrect connector unseated height is called out in the connector database.

When this condition is encountered, the press head will rise to the board clearance position and display a message. Careful inspection will usually reveal the problem. If the error is generated the first time a new program is run, expect a dimensional error in one of the data files. In some cases, it is OK to try again, such as when the un-pressed connector was tilted, and the head corrected the lean when it touched the tool. Use caution when retrying because if there is a bent pin, the retry may bend it over further and press it flat to the connector bottom. A properly defined Profile will detect this condition and generate an appropriate error, but the connector may be damaged beyond repair at that point.

Missing Connector – When this error is generated it will be obvious if a connector is missing. If the connector is not missing, then there is probably an error in the Profile or tool/connector/PCB/fixture dimensions that must be corrected by the programmer. This might also occur if the Machine Zero setting is incorrect due to a condition that requires repair of the press.

Excess Force - This error is displayed when the force required to seat the connector exceeds the programmed limit. There may be a problem with the connector (oversized/bent pins) or PCB (undersized holes) causing too much resistance before the connector reaches its seated height. The fixture, PCB, tool and/or connector could be too thick, causing the connector to contact the PCB higher than expected. There may be a problem with the force or height definitions in the Profile program. In addition to the user-defined profile error message, an “Excess Force” profile error message will appear any time maximum force per pin (MaxFPP), as specified in the connector database, is exceeded – even when another Force (such as PARS) and/or Force Action is specified on the profile line.

Insufficient Force - This error can be caused by a loose pin-to-hole interference. It can also be caused by the fixture being too thin, connector thickness problems, incorrect dimensions in the tool or connector database, or Profile program errors. The programmer should be consulted to correct the problem.

Diagnostics –The “Cursors” and “Graph Options” menus located below the production graph can be used to enable or disable various diagnostic graph options and cursors. This data can be useful in understanding the profile path taken while pressing.

Data Collection – Detailed data is collected for each press and written to the machine log files.

“Export Production Graph” – This button is located under the “Graph Options” menu and can be used to save the displayed Force vs. Distance Graph to an external drive as a pdf file.

7. PRESSING TOOLS AND FIXTURES

This section defines the general requirements for connector pressing tools and fixtures (platens) that will be used in the press. In most cases, insertion tools and fixtures used in other manual pressing operations can be used in this press.

7.1. Tools

The guidelines below must be followed to ensure optimum performance.

- Width – May be any width that adequately supports the pressing force.
- Height – There is up to 130 mm clearance from table to the full up pressing head (less if using anvil spacer on CBP). The tool, backup fixture, connector, and board assembly must be less than this measurement.
- Length – may be up to 250 mm (to stay within the capture of the flat rock head), single or multiple tool combination.

7.2. Support Fixtures (Platens/ Backup Fixtures)

The support fixture, sometimes called a platen, must be made of a reasonably rigid material. The flatness should be held to a maximum deviation of 0.10 mm for best results. Most fixtures in use on other type presses are adequate, but flatness is often poor. Pressing to height will be a problem if the fixture is not flat.

8. PROGRAMMING & DATA ENTRY

The press is a highly versatile tool due to simple yet flexible programmability. Five databases are used to guide the press through specific sequences of operations. The variables stored include pressing tool physical information, pressing profile information, connector physical information, non-pressing sequence operations called “conditions”, and PCB/ backup fixture information. Once the information has been stored, it is available for use by current and future programs.

Access to the editors is normally restricted to levels above “operator”. The editors can be accessed from the Editors drop-down-menu. To open an editor screen, select the appropriate item from the Editors drop-down.

8.1. The Tool Editor

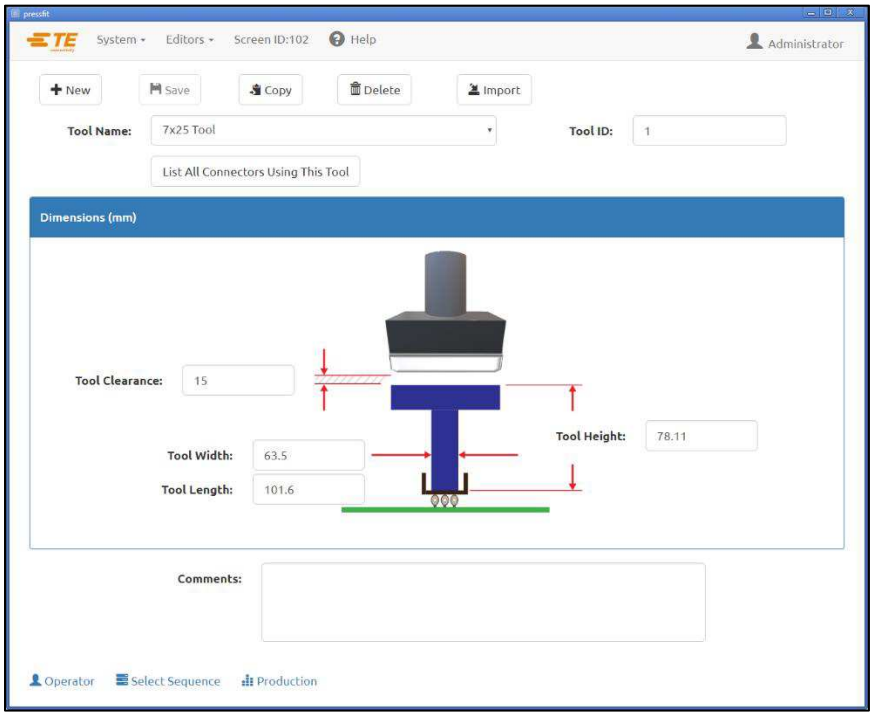

Figure 32

A. Purpose

The tool editor is used to view and modify the tool data base, which is an sqlite database file. It contains all the necessary information about the mechanical pressing tools that are used during the pressing process. The editor can be accessed either from the Editors drop-down menu. The following fields are maintained in the database and are saved when the “Save” button is pressed.

B. Entries

“Tool Type” - This is a name you choose up to 30 characters long, spaces allowed, that will be used to refer to this tool in the future. To enter a new tool type, select “New”. Alternatively, you can select “Copy” to copy the currently viewed tool. You must enter a new name. Selecting “Delete” will delete the currently viewed tool entry. Selecting “Save” will save the currently viewed tool entry.

“Tool ID” - This is the unique number that is used to identify the tool. It can be engraved and/or bar coded the tool. It is convenient to use a bar code reader to confirm the tool type at run time.

NOTE
ONLY interchangeable duplicates would ever have the same PN. In this case, only one entry is made in the database.

“Dimensions”

Tool Height – The tool height information is needed in order to confirm the pressed height of the connector. Enter the height of the tool from the top surface to the plane that presses on the connector as shown in the graphic.

Tool Clearance – The tool clearance information is need to calculate how much space to leave between the anvil and tool when the press anvil is moving to the clearance height prior to pressing.

Tool Width – This entry is used for traceability purposes, and is not used for any portion of the pressing operation.

Tool Length – This entry is used for traceability purposes, and is not used for any portion of the pressing operation.

“Comments”

Enter any comments desired such as a short description of the tool application.

8.2. The Connector Editor

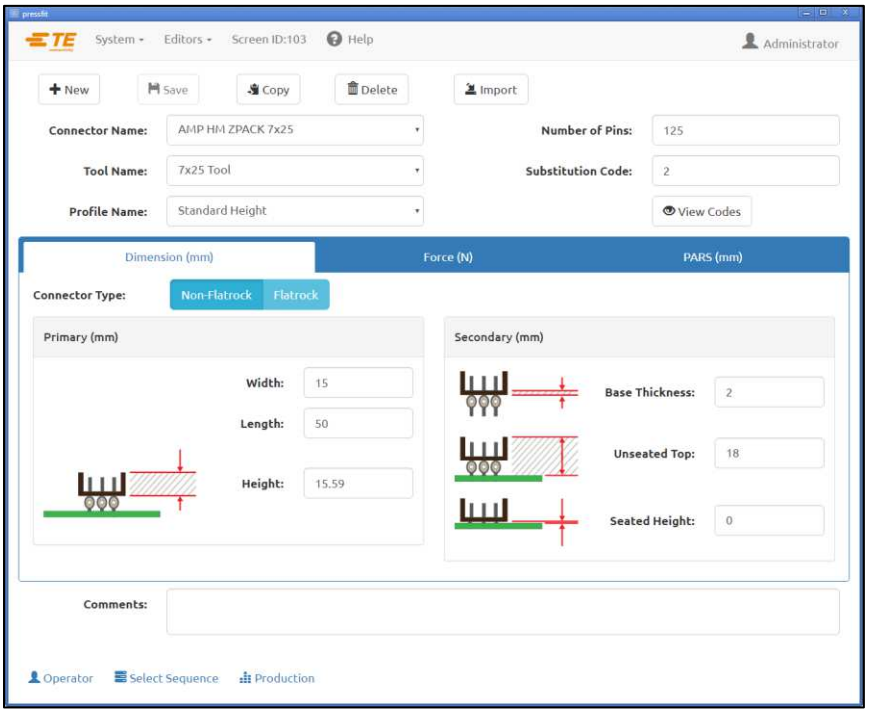

Figure 33

A. Purpose

The Connector Editor (see Figure 33) is used to view and modify the connector data base, which is an *sqlite* database file. The editor can be accessed from the Editors drop-down menu. All changes are saved upon pressing the “Save” button.

B. Entries

“Connector Name” - This is a name you choose up to 30 characters long, spaces allowed, that will be used to refer to this connector in the future. To enter a new connector type, select “New”. Alternatively, you can select “Copy” to copy the currently viewed connector. You must enter a new name. Selecting “Delete” will delete the currently viewed connector entry. Selecting “Save” will save the connector to the database. The “Import” button can be use to import a legacy connector file into the connector database.

“Tool” - This is the type or name of the tool to be used for pressing the connector. It is picked from the tool data base entries using the drop-down menu. The tool must be entered in the tool database before the connector data can be completed.

"Number of Pins" - This is the number of pins in the connector. It is used to calculate force when using max or min force per pin in the profile. It is also used to calculate and graph the force per pin on the run time screen.

"Profile" - This is the name of the profile file to be used for the connector. It is picked from the profile data base entries using the drop-down menu. The profile must be completed before the connector database can be generated.

"Dimensions" Tab

Primary Dimensions:

Height - This is the measurement of distance from the top of the connector to the seating surface of the connector. Subtracting 'Unseated Top' from 'Height' will give actual amount of distance left to press connector to seated condition.

Length – This dimension is only used for traceability and rendering the connector image on the Production screen.

Width – This dimension is only used for traceability and rendering the connector image on the Production screen.

Secondary Dimensions:

Base Thickness - This is the thickness of the connector between the inside (mating section) bottom and the outside bottom as shown. It is used to calculate the head travel to seat the connector to the proper height.

Unseated Top - This is the measurement of the distance of the top surface of the connector to the top surface of the PCB.

Seated Height - This is the desired distance between the board surface and the bottom of the connector after pressing. It is usually zero, but may be set above the board surface for press to height applications.

"Force"

- Min Force / Pin - This is the minimum acceptable force per pin. It is referenced in the pressing profile.
- Max Force / Pin - This is the maximum acceptable force per pin. It is referenced in the pressing profile.
- User Force / Pin - This is a user defined force per pin. It is referenced in the pressing profile.
- Other Force - This is a user defined fixed total force offset (not per pin) such as might be utilized to compensate for using a spring loaded pressing die. This force is subtracted from the force readings before they are compared to the press profile Force limits and graphed.

Force Gradient Panel:

Force Gradient monitors the rate of change of force to distance. Generally, the force vs. distance plot will make a steep upturn as the connector contacts the board surface. A minimum slope is specified for the upturn which corresponds to how solidly the connector is pressed against the board. This slope is entered using a ∆ Force/∆ Distance (the change in force divided by the change in distance).

∆ Force - Enter the change in force, which is the numerator of the slope you want to watch for to complete the press cycle. The value entered is used in conjunction with ∆ Distance when Force Grad from Connector Database is selected in the Profile Editor.

∆ Distance - Enter the change in distance, which is the denominator of the slope you want to watch for to complete the press cycle. The value entered is used in conjunction with ∆ Force when Force Grad from Connector Database is selected in the Profile Editor.

Legacy Force Gradient – Users accustomed to using the force gradient method implemented on legacy machines can use the conversion tool located within the “Force Gradient Panel” to automatically determine the Δ Force and the Δ Distance by entering the legacy graph scale value and legacy angle value. The Δ Force and the Δ Distance values will automatically be calculated and updated when the “Angle” or “Scale” fields are changed.

“PARS” - A connector can be pressed with force that is proportional to the actual resisting force detected during the pressing cycle. This profile is controlled by the start and finish connector height and % of force applied over what is detected at end of cycle. The % value entered here is used when **PARS from Connector Database** is selected in the Profile Editor.

“Comments” - This is a field for useful comments

8.3. The Profile Editor

A. Purpose

The Profile Editor (Figure 34, Figure 35, and Figure 36) is used to view and modify pressing profiles. A pressing Profile is information that is used to control the pressing process speed, force, and height. It is the heart of the control sequence, and allows the user to define exactly how a connector is pressed into the PCB. The editor provides up to 20 steps, numbered at the left of the screen, to be entered for a given profile. Profiles are stored in an sqlite database with a user-specified name The profile editor can be accessed under the Editors drop-down menu.

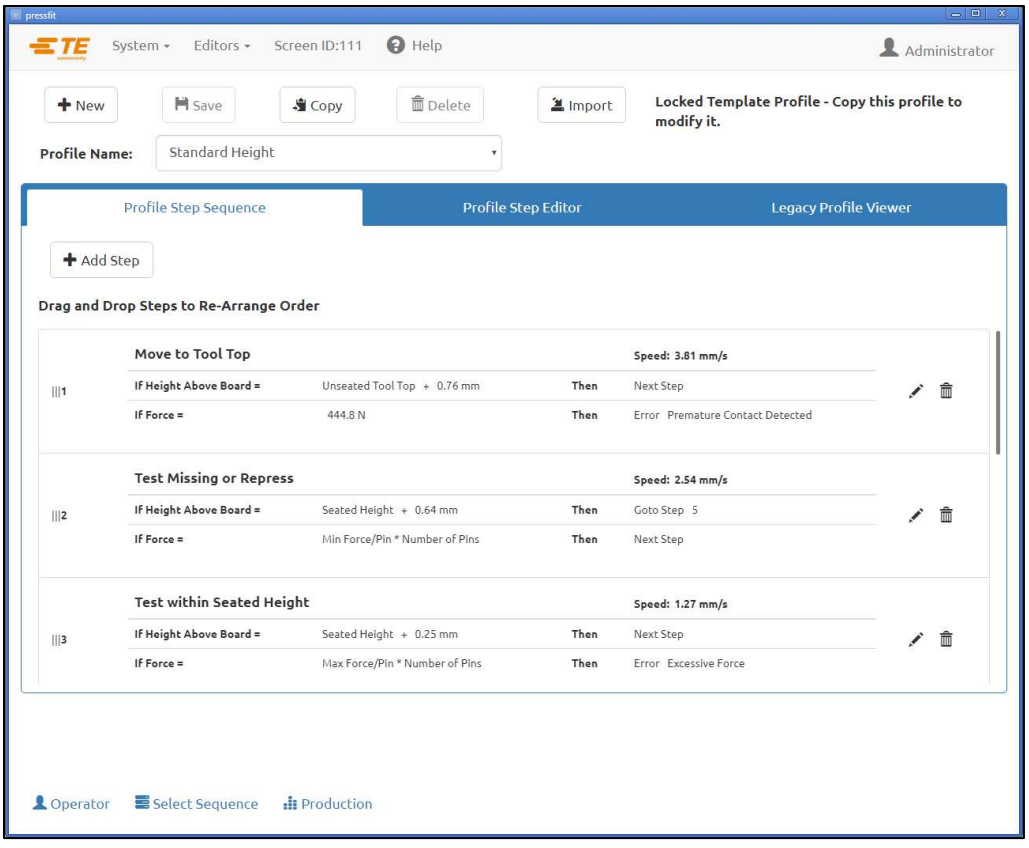

Figure 34

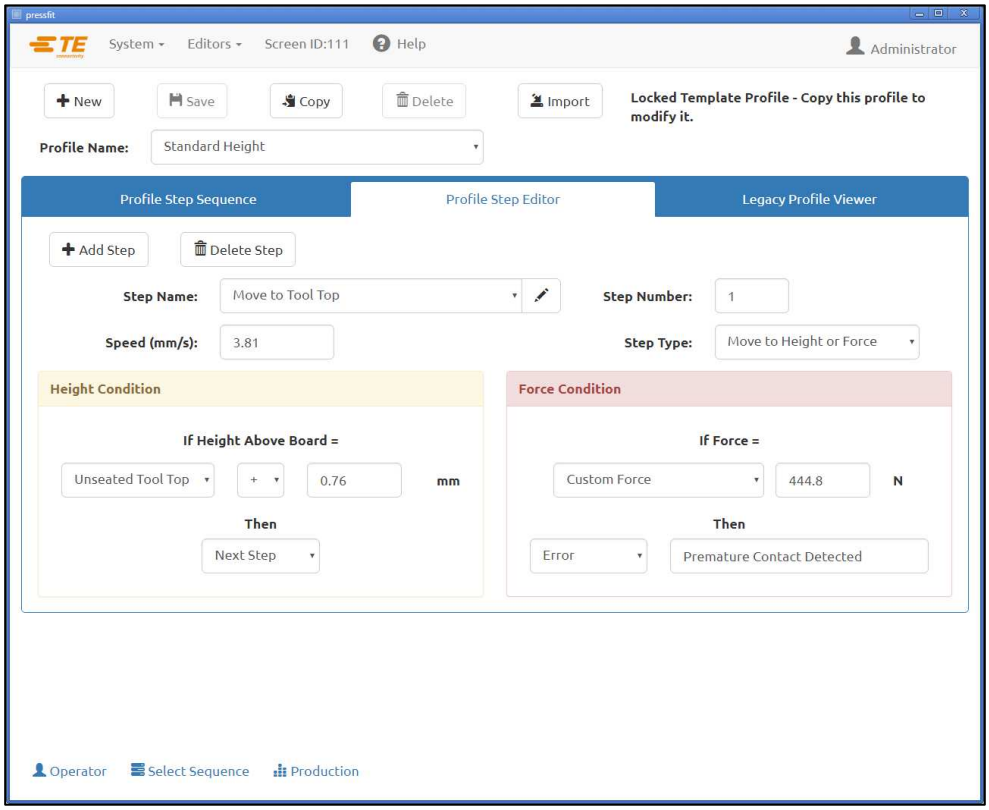

Figure 35

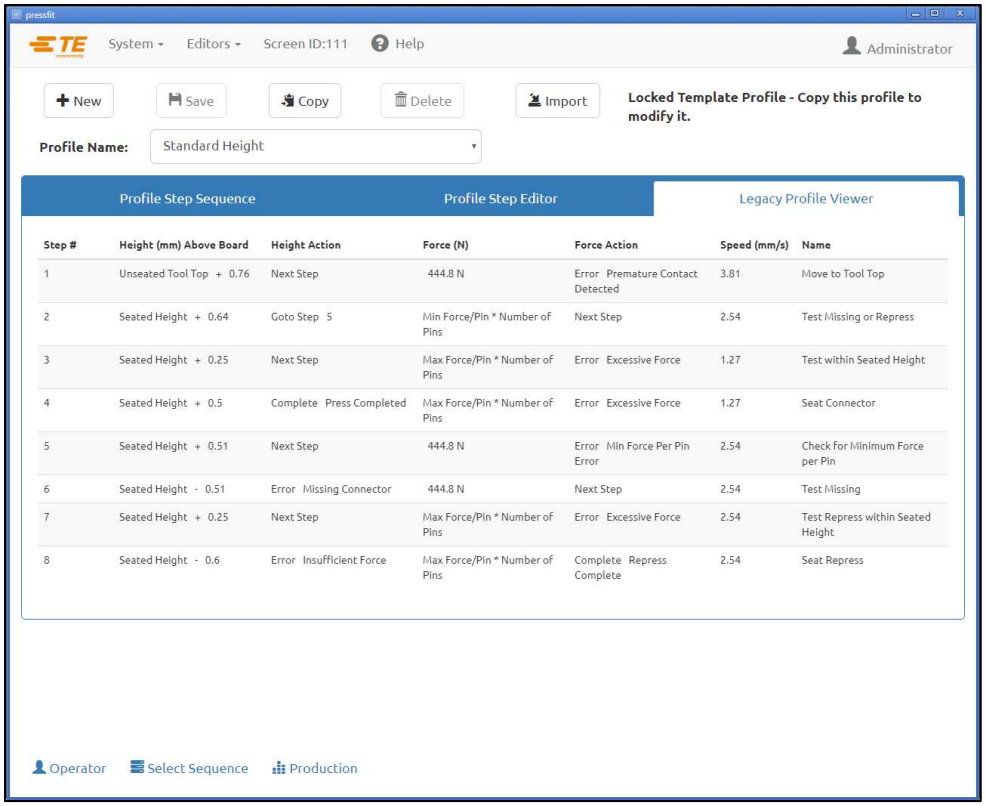

Figure 36

B. Explanation

The insertion process starts at row 1, and proceeds from there. Each row can be one of three different types: “Move to Height or Force”, “Delay”, and “Retract”. The “Move to Height or Force” type is the most commonly used step type. This step type has a “Height” and a “Force” condition. As the press head travels down, the program continuously monitors these conditions and acts on whichever condition is met first. The Height condition is checked first so it takes priority in the case that both occur simultaneously. The “Delay” step type can be used to delay the pressing profile by a specified amount of time in milliseconds before continuing with the remainder of the profile. The “Retract” step type can be used to raise the press head a specified distance before continuing with the remainder of the profile. Each condition (“Height”, “Force”, “Delay”, or “Retract") has an “action”, which either continues the pressing process at another step or generates an error. These events and actions are used to:

- detect and announce unexpected contact
- detect unacceptably high or low force generated during pressing
- detect a missing connector condition
- press to/verify the proper seated height
- repress a connector that has already been partially pressed
- pause for a fixed time period before proceeding
- retract the head a small distance to momentarily relieve force before proceeding

There are four basic methods of pressing, and each requires a unique profile.

- **FIXED FORCE PER PIN** - A connector can be pressed with a force proportional to the number of pins, such as 30 pounds per pin. This is slightly better than the simplest method of pressing to a single fixed total force because it recognizes that the force applied should be proportional to the number of pins being pressed. It cannot compensate for normal variations in required force per pin for different connectors, in different positions, in different boards.
- **PERCENT ABOVE RANGE SAMPLE (PARS)** - A connector can be pressed with seating force that is proportional to the actual pin resisting force detected during the pressing cycle. This is called “**Percent Above Range Sample**”, or **PARS**. In this technique, the connector’s pin resisting force while pressing is sampled and averaged over a distance **R**ange before final seating to the board surface. The final force exerted on the connector is limited to a user-programmed **P**ercent **A**bove the **R**ange **S**ample force. This percent added assures complete seating of the connector against the PCB. This is the most widely used technique because it limits the stress to the assembly, does not require accurate board thickness measurement and automatically adjusts for small variations in connector and PCB thickness.
- **PRESS TO HEIGHT** - A connector can be pressed to within a programmed distance *short of seating* on the board surface. This is the gentlest process possible because it exerts only enough force to press the pins into the plated holes in the board. No excess force is pressed into the connector plastic or the board. This sophisticated technique is made possible by the control available using an electric servo press head and a rigid press structure. In order for press to height to be accurate, the board thickness must be precisely known. This can be done using the thickness measurement probe and sequence provided.
- **FORCE GRADIENT** - Monitors the rate of change of force to distance. This method is used for robust connectors that need to be seated against the board surface. Generally, the force vs. distance plot will make a sudden steep upturn as the connector contacts the board surface. The connector stops moving so the force rises quickly. A minimum slope is specified for the upturn which corresponds to how solidly the connector is pressed against the board. Note that the slope is calculated using the ratio of the change in force (△Force) over the change in distance (△Distance) specified by the user in the profile or in the connector part.

A “standard” profile template for each of the techniques above is provided with the press. They use variables whose values come from the Connector and Tool databases rather than discrete numbers. Since each connector requires the same basic steps, one profile with variables can be used for many different connectors.

The standard profiles are named “standard_force_CDB”, “standard_pars_CDB”, “standard_HGT” and “standard_FG_CDB”. Example #1 below is the “standard_pars” profile.

C. Navigation Tabs

"Profile Step Sequence" - This tab shows the profile in a step-by-step list format. The name and details of each step are displayed in a read-only format. The "Add Step" button can be used to create a new step to be added to the profile. The new step will be opened in the "Profile Step Editor" tab. The "Edit Step" button (pencil icon) is located to right of each step. This button will open the corresponding step in the "Profile Step Editor" tab for editing. The "Delete Step" button (garbage can icon) will delete the corresponding step (the user will be prompted to verify the operation before the step is deleted).

"Profile Step Editor" – This tab shows a single step in editing mode, allowing the user to customize all aspects of the profile step using the various entries listed below.

"Legacy Profile Viewer" – This tab shows the entire profile in a view that is identical to layout of the legacy press fit profile editor.

D. Entries

"Step Name" - This entry is for your use to define or describe the purpose of this step.

"Step Number" – This entry is used to specify where in the profile the step will be located sequentially.

"Speed (mm/s or in/s)" - This is the speed target for the current step in the process. The speed starts at "Run Speed" and changes ("ramps") linearly down to the speed given in step 1. When step 1 Height is reached, the speed then ramps to the speed given in the next step processed. This will generally be step 2, but not if a "Goto Step" was programmed as an action (see Figure 37).

Typical speeds range from 8 mm [.315 in.]/second during approach, down to 1 mm/second when pressing. Some experimenting may be required to optimize the process. Some connectors are more fragile than others and may require slow speeds, while others can be pressed quickly.

Figure 37

"Step Type" – Used to specify whether the step will be a "Move to Height or Force", "Delay", or "Retract" type step.

Figure 38

"Height Dimension" - This is used to define the next destination of the pressing surface of the tool above the board. This field specifies whether a dimension from the connector stackup should referenced ("Unseated Tool Top", "Seated Height") or whether the user will specify a fixed "Custom Height" using the "Custom Height" entry field (see Figure 39).

Figure 39

“Offset” – This is used in conjunction with “Height Dimension” to define the next destination of the pressing surface of the tool above the board. A positive or negative offset value can be entered to adjust the destination height to be slightly above or below the selected “Height Dimension”. (Note: this field is not used when “Custom Height” is selected).

The press head will drive down to the height defined by these fields at a speed that is linearly “ramped” from the height and speed of the previous step.

The initial height (before step 1) is defined by the height stackup of the board, fixture, connector, tool, and tool clearance. The available “Height Dimensions” are shown here. Alternatively, a fixed positive numeric height can be entered. This specifies a height of the tool above the press table top surface, without regard to PCB, connector or fixture thickness.

“Height Action” - This defines the action to be taken when the height at this step is reached as shown in Figure 40.

Actions are selected from the drop-down menu. The available actions are:

- **Next Step -** This directs the process to the next step below.
- **GoTo -** This directs the process to continue at the specified step. The step number is entered in the numeric field.
- **Complete -** This signals that the pressing process is complete. The head will stop immediately and rise to the next tool clearance height. A completion message can be entered by the user in the adjacent text field.
- **Error -** These are user defined error messages. If the height is reached and the action is an error, the pressing process is immediately halted and the error message is displayed on the screen. The operator must acknowledge the error message to continue.

Figure 40

“Force Measurement” - This defines the force which will trigger the force action. There are eleven variable choices provided on the drop-down menu. An actual force in pounds can be entered in a numeric field using the “Custom Force” option (see Figure 41).

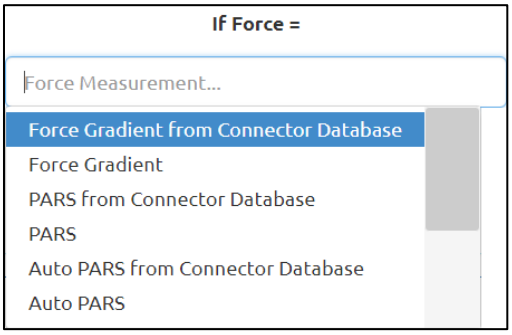

Figure 41

- ***PARS -*** *This is a dynamic press cycle termination based on actual forces generated during the pressing process. PARS is defined as "Percent Above Range Sample" (Force Per Pin Limited). This force condition uses a special algorithm that calculates the average force generated while pressing the connector into the PCB. The "Start" and "Distance" boxes in the middle of the screen define the bounds for the average. Thus, rather than pressing to a specific force, the actual force required is dynamically calculated for each cycle and termination is based on this force. The "%" is an excess force, as a percentage of the calculated average, which is added to the average to ensure the connector is fully seated.*

  For example: The "Start Height" is entered as 0.40 mm [.016 in.] and the "Distance" as 0.20 mm [.008 in.]. PARS force is invoked in the 'Force (N)'column, row 4, and 25% is entered. As the connector is pressed, the force readings taken from 0.40 mm to 0.20 mm [.016 in. to .008 in.] above the board are averaged. The head continues to press until the force generated is 25% higher than this average. Note that if the force exceeds 125% of the average before the PARS line (row 4 in this example) is reached, the press will stop at the higher % value attained when row 4 is reached. The "FPPL" feature means that the press will always stop on error if Max FPP (specified in the Connector Editor) is exceeded before the specified PARS value is reached.

- **PARS from Connector Database-** Same as above except the percent, start height, and distance values are obtained from the connector database entry for this connector type.
- **Auto PARS –** This force condition locates the PARS region that is below the entered "Start Height" and of the entered "Distance" that has the minimum average force, and performs PARS analysis on it based on the PARS percentage entered. This is effectively a "rolling" PARS analysis that uses what is theoretically the best PARS region below the entered "Start Height".
- **Auto PARS from Connector Database –** Same as above except the percent, start height, and distance values are obtained from the connector database entry for this connector type.
- **Force Gradient -** This technique monitors the rate of change of force to distance. This method is used for robust components that need to be seated firmly. Generally, the force vs. distance plot will make a sudden steep upturn as the component contacts the mating surface. The component stops moving so the force rises quickly. A minimum slope is specified for the upturn, which corresponds to how solidly the component is pressed. The slope is calculated using the ratio of ∆Force and ∆Distance entries specified by the user.
- **Force Gradient from Connector Database-** Same as above except percent value is obtained from the connector database entry for this connector type.
- **Min Force/Pin * Number of Pins -** This force is calculated by multiplying the number of pins in the particular connector being pressed by the minimum required force per pin. Both the number of pins and the minimum force per pin are entries in the connector data base. This can be used to assure at least a minimum force is generated during the pressing process.
- **Max Force/Pin * Number of Pins -** This force is calculated by multiplying the number of pins in the particular connector being pressed by the maximum allowable force per pin. Both the number of pins and the maximum force per pin are entries in the connector data base. This can be used to prevent excessive force from being generated during the pressing process.
- **User Force/Pin * Number of Pins -** This variable is provided for the flexibility of defining a force event variable other than Max and Min force per pin. Its use is up to the programmer's discretion. For example, while pressing to force it may be useful to terminate on "User Force/Pin * Number of Pins" rather than "Max Force/Pin * Number of Pins". The variable "Max Force/Pin * Number of Pins" would still be used to generate an error if the allowable force is exceeded.
- **User Force/Pin * Number of Pins * -** Same as above except a step specific custom multiplier can be added to adjust the calculated value.
- **Custom Force –** Allows the user to specify a fixed custom total force value will trigger the force action.

"**Force Action"** - This defines the action to be taken when the force at this step is reached. Actions are selected from the drop-down menu. The force actions are the same as the Height Actions (see Figure 42).

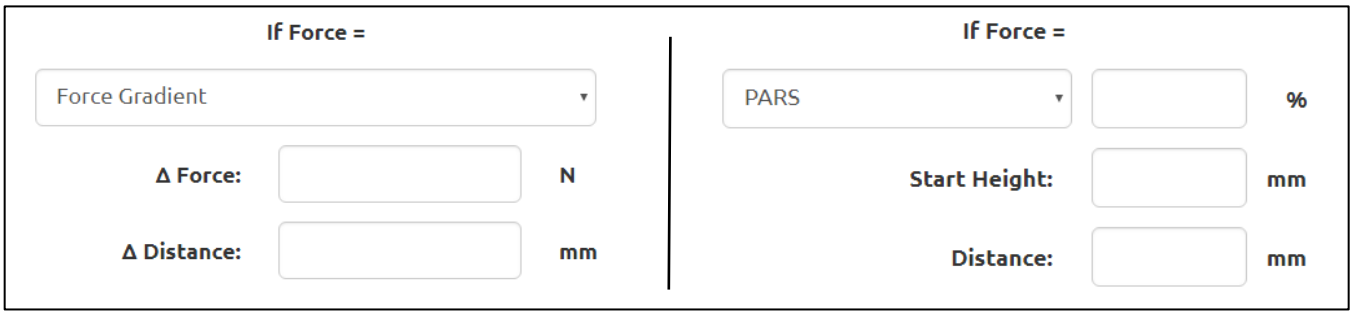

Figure 42

"Delay" – This specifies a delay in milliseconds that the profile will wait before continuing with the "Delay Action".

Delay Action - This defines the action to be taken after the delay at this step is executed. Actions are selected from the drop-down menu. The delay actions are the same as the Height Actions.

"Retract" – This specifies a distance that the press head will retract (or move upward) before continuing with the "Retract Action".

Retract Action - This defines the action to be taken after the retract movement at this step is executed. Actions are selected from the drop-down menu. The retract actions are the same as the Height Actions.

E. **Action Buttons**

Main Profile Editor Buttons:

"New" – Press to create a new profile. Profile will not be saved to the database until "Save" button has been pressed.

"Save" – Press to validate and save the current profile to the database. This will also attempt to validate and save the current step being editied if it has not been validated. To save the profile under a different name, press "Copy" to duplicate the current profile and "Save" to save under a different name.

"Copy" – Press to create a duplicate of the current profile. The new duplicate will not be saved to the database until the "Save" button has been pressed.

"Delete" – Press to delete the current profile from the Profile database. The user will be prompted to verify this operation before it is executed.

"Cancel" – Press to discard any unsaved changes to the current profile.

"Import" – Press to import a legacy profile file into the profile database .

Profile Step Editor Buttons:

"Add Step" – Press to create a new blank step. Note: Step will not be added to the profile until step has been validated using "Validate Step" button.

"Delete Step" – Press to delete the current step. Note: User will be prompted to verify deletion of step before executing

"Save Step" – Press to confirm that all required step fields have valid entries and add or update the current step in the profile. A new step will not be added to the profile until the step has been validated. Changes or updates to an existing step will not be added to the profile until after the step has been validate.

"Cancel Changes" – Discard an unvalidated new step or discard any changes to an unvalidated existing step.

Example: Pressing with PARS (Figure 43)

Profile Step Sequence | Profile Step Editor | Legacy Profile Viewer

Step #	Height (mm) Above Board	Height Action	Force (N)	Force Action	Speed (mm/s)	Name
1	Unseated Tool Top + 0.75	Next Step	250 N	Error Premature Contact Detected	7	Move to Tool Top
2	Seated Height + 1	Goto Step 5	Min Force/Pin * Number of Pins	Next Step	5	Test Missing or Repress
3	Seated Height + 0.25	Next Step	Max Force/Pin * Number of Pins	Error Excessive Force	5	Test within Seated Height
4	Seated Height - 0.5	Error Insufficient force	PARS from Connector Database	Complete seated	2	Seat Connector
5	Seated Height + 0.9	Next Step	250 N	Error Min Force Per Pin Error	2	Check for Minimum Force per Pin
6	Seated Height - 0.5	Error Missing Connector	250 N	Next Step	2	Test Missing
7	Seated Height + 0.25	Next Step	Max Force/Pin * Number of Pins	Error Excessive Force	2	Test Repress within Seated Height
8	Seated Height - 0.5	Error Insufficient Force	Max Force/Pin * Number of Pins	Complete Repress Complete	2	Seat Repress

Figure 43

The screen capture example shown in Figure 43 is a typical PARS press profile. The name at the left end of each line indicates the action that line will perform. In general, PARS pressing is the preferred method because it limits excess pressing force but still presses the connector to the board surface. Fragile connectors that cannot accept any excess force must be pressed to height as described in the example below.

1. Move the head from the tool clearance height (as given in the Tool Database) down to 0.75 mm [.030 in.] above the unseated top of tool. The speed will ramp linearly from the press “Run Speed” down to 7 mm [.276 in.] per second. When the height is reached, the sequence will continue on the next step. If more than 250 Newtons [899 ozf] are detected before the height is reached, terminate and display error #1, typically “Premature contact detected”.
2. Continue to move down until the connector is 1.0 mm above its seated height. The speed is reduced to 5 mm/second. This line tests to see if a connector is actually detected. If it is, as indicated by detecting at least the minimum force per pin (MinFPP), the process continues on the next line. If not, the process continues on line 5 to attempt a repress of a previously pressed (full or partial press) connector.
3. Press until the connector is within 0.25 mm of the desired seated height. When this position is reached, the connector will be within a generally accepted tolerance of seated height. The 0.25 mm can be adjusted as needed for specific circumstances. If the force exceeds the maximum force per pin (MaxFPP) before the height is reached, an error message is displayed.
4. The destination of this step will theoretically over press the connector, but the process will actually be complete as soon as the force reaches the PARS region average force plus an additional percentage specified in the connector database. The height given simply provides a destination that is not intended to be reached because the force condition will be satisfied first. If the destination is reached (on the correct connector) before the PARS force is reached, then there is most likely an error in the parameters used to calculate the distance relationship between connector, tool, and board surface. If this occurs, review the tool height, the connector base thickness, the backup fixture thickness, and the board thickness. Note that a PARS line also monitors for MaxFPP. If MaxFPP is exceeded before reaching the PARS force, then pressing will stop with an “excess force” error. The speed will linearly slow to 2 mm/second by the target height.

5. This step is only reached by the “GO TO” Height Action from Step 2. It tests for a connector that simply failed to reach MinFPP by the appropriate height, by checking for 250 Newtons force detected within 0.1 mm below the MinFPP minimum height from Step 2. The speed will linearly slow to 2 mm/second by the target height.

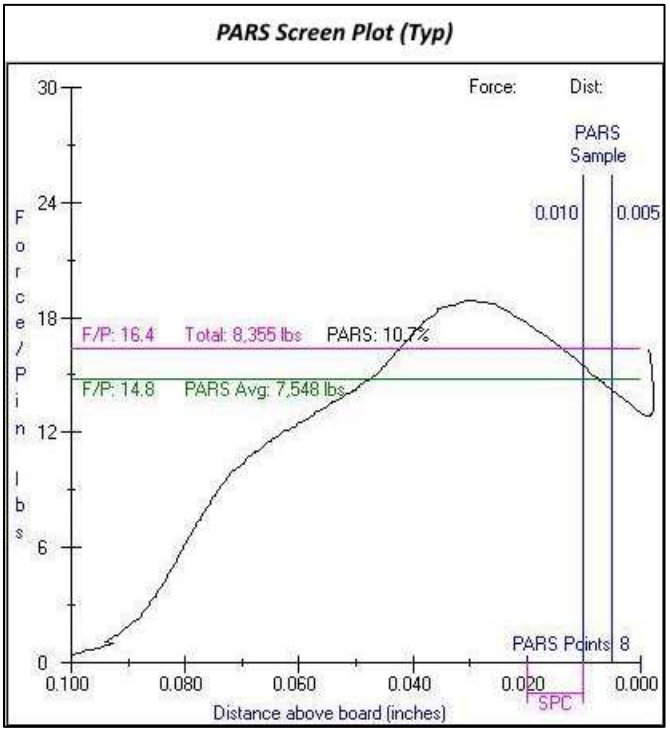

Figure 44

6. This step checks for a missing connector if 250 Newtons force is not detected, even below the lowest seated height. As soon as this level of force is detected, the process continues on the next line.
7. This line verifies the connector is pressed to within generally accepted height tolerance, and the maximum force per pin is not exceeded.
8. This line gives a destination below the nominal seated height and terminates on the maximum force per pin * # of pins. This variable here could also be “user force per pin” instead of MaxFPP, if a lower repress force is desired. Final seating of a repress is generally done to a target force because the initial position of a repress cannot be known. PARS termination cannot be used for a repress since there often is no “pin penetration” force region to sample when the connector has previously been partially pressed. While Force Gradient termination could be used with very rigid connectors and PCB’s (after reaching some minimum seating height and force), most connector represses apply MaxFPP.

8.4. Condition Editor

A. Purpose

The Condition Editor (see Figure 45) is used to enter and store non-pressing sequence actions called Conditions in the database. A condition is a series of one or more steps containing machine actions arranged in a When/Then/Else logical format. Conditions are used in conjunction with Connectors to create the Press Sequence.

The Condition is saved in an sqlite database. When generating a new condition or using a template condition, it may be convenient in some cases to open an existing condition and do a “Copy” to duplicate the Condition and a “Save” to store the condition under a new condition name.

The Condition Editor can be accessed using the “Editors” drop down menu.

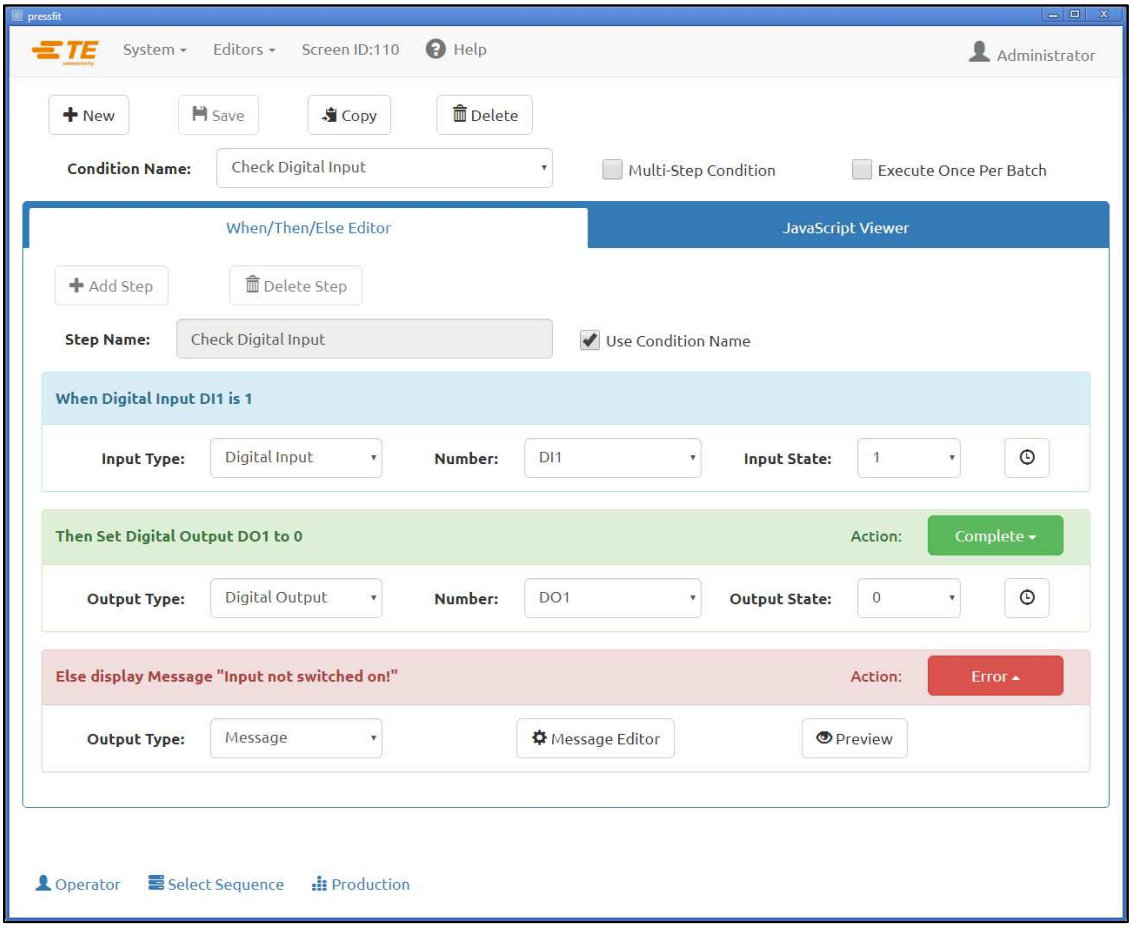

Figure 45

B. Explanation

Each condition step typically consists of three parts: a “When” operation, a “Then” operation, and an “Else” operation. The “When” operation functions as the step input, which determines whether the “Then” or “Else” output operations will be executed. If the result of the “When” operation is true, the “Then” output operation will be executed. If the result of the “When” operation is false or the operation times out, the “Else”output operation will be executed. See the basic example in statement form below.

When Operation: When Digital Input DI1 is 1 within 1000ms,

Then Operation: Then set Digital Output DO1 to 0,

Else Operation: Else display Message “Input not switched on!”

In example above, the condition step will continously check Digital Input DI1 to see if it has been switched on (the “When” operation). If the input is switched on before the 1 second timeout, the “When” operation evaluates to “true”, and Digital Output DO1 is turned off (the “Then” operation is executed). If Digital Input DI1 is not switched on before the 1 second timeout, the “Else” operation is executed and a message dialog box is displayed informing the user that the input was not switched on.

In addition to the operations carried out by each condition step, the “Then” and “Else” output operations also have a completion action associated with them that defines how the condition should proceed after completing the step. The available completion actions are “Complete”, “Error”, “Next Step”, and “Goto Step *n*”.

Complete: After executing the “Then” or “Else” operation, the condition will complete successfully and the next step in the press sequence will execute.

Error: After executing the “Then” or “Else” operation, the condition will complete and abort the press sequence. The first step in the press sequence will be loaded and executed.

Next Step: (Only available for multi-step conditions) After executing the “Then” or “Else” operation, the next step in the condition will be executed.

Goto Step *n*: (Only available for multi-step conditions) After executing the “Then” or “Else” operation, step *n* in the condition will be executed.

C. Entries

“Condition Name” - This is a name you choose up to 30 characters long, spaces allowed, that will be used to refer to this condition in the future. To enter a new condition type, select “New”. Alternatively, you can select “Copy” to copy the currently viewed condition. You must enter a new name. Selecting “Delete” will delete the currently viewed condition entry. Selecting “Save” will save the condition to the database.

“Multi-Step Condition” – Select this checkbox to allow this condition to have multiple steps. Deselect this check box if this is a single-step condition.

“Execute Once Per Batch” – Selecting this checkbox will set this condition so that it is only executed the first time the press sequence is run for the current batch. Reloading the press sequence will start a new batch.

When/Then/Else Editor Tab – This tab contains all the button and input fields necessary to create a condition step. Press the “Add Step” button to create a new step in multi-step conditions. Press the “Delete Step” button to remove the currently selected step from a multi-step condition. Press the “Save Step” button to store any changes to the current step in a multi-step condition (this does NOT save the changes to the database). Press the “Cancel Changes” button to discard any changes to a step that has been edited.

“Step Name” – The step name is used to describe and identify the current condition step.

“Use Condition Name” – (Single step conditions only) Selecting this checkbox automatically sets the “Step Name” so it is identical to the “Condition Name”.

“Step Number” – (Multi-step conditions only) This entry is used to specify where in the condition the step will be located sequentially.

“When” box – Entries within this box define and describe the “When” input operation of the current condition step.

“Input Type”– This dropdown selects the type of input operation to perform for this condition step. Available input types are “Step Start”, “Message Response”, “Clearance Move”, “Measure Board”, “Digital Input”, “COM Port”, “Move Shuttle”, and “PPS Tool”.

Step Start– This input type is used to make the “When” operation always evaluate to “true”. The step will go directly to executing the “Then” operation, and the “Else” operation will be hidden from the editor window. This input type is useful when the user needs a condition step to always execute a single output operation and continue on.

Message Response– This input type is used to display a message to the screen via a dialog box or the production action button. This input type can also solicit a button press response from the user and will execute the “Then” operation or “Else” operation based on the users response. This input type is useful for providing status updates, querying the user, and requiring signoff from a user with elevated access rights.

“Message Editor”– This button opens the “When” Message Editor window (see Figure 46) used to customize the message display. To keep the changes made in this window, click “OK”. To discard any changes made in this window, click “Cancel”.

Last Press Result- This input type will evaluate the result of the last connector press.

"Result Mode"-This dropdown selects which portion of the press result to evaluate. Each press result contains a "Status", "Code", and "Message" that can be evaluated.

"Status"-This dropdown is displayed when the "Status" result mode is selected. The press result status can be either "Complete" or "Error". This is the most basic way to evaluate the press result.

"Code"-This text entry field is displayed when the "Code" result mode is selected. The press result code is a 3-digit number that indicates whether the press completed successfully or with an error, and indicates which profile step that the press completed. Presses that have completed successfully will have a code from 151 to 200. Presses that have encountered an error will have a code greater than 200 or less than 151. The code can be used to evaluate the press for a complete or error result generated by a specific step.

"Message"- This text entry field is displayed when the "Message" result mode is selected. The press result message is the text entered in the "Message" field of a press profile step with a "Complete" or "Error" action. The message can be used to evaluate the press for a complete or error result generated by a specific step or a specific group of steps that have identical messages.

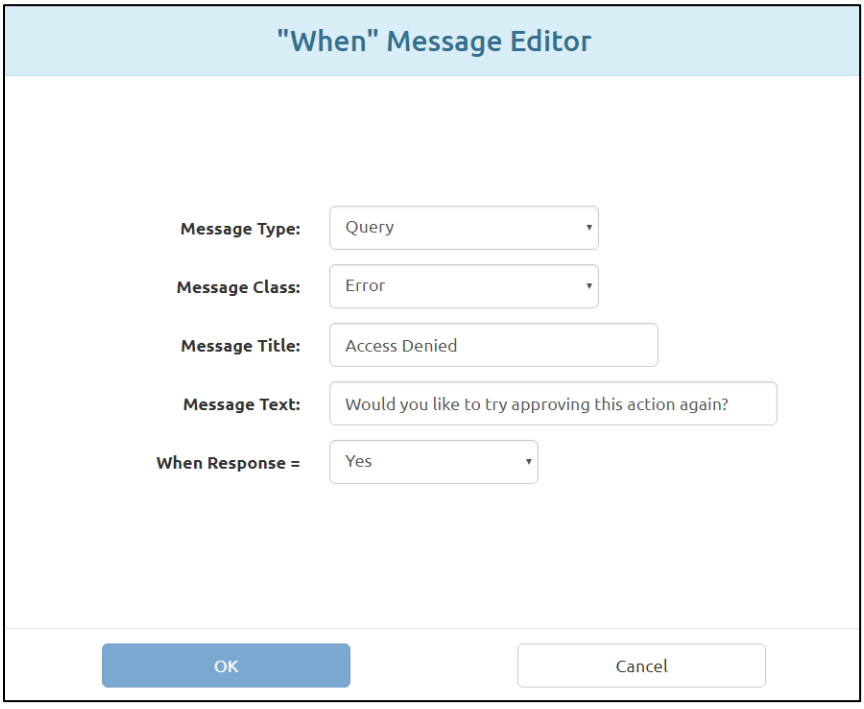

Figure 46

“Message Type”– This dropdown selects the type of message to display. The available message types are

Acknowledge – This message type displays a message dialog box with a single “OK” button for the user to acknowledge the message.

Query – This message type displays a message dialog box with a “Yes” button and a “No” button for the user to answer a question.

Accept – This message type displays a message dialog box with an “OK” button and a “Cancel” button for the user to either accept what is proposed in the message prompt or cancel .

Action Button – This message type displays a message to the production action button and action button status box. This type is useful for prompting the user to initiate the next step in the press sequence.

User Sign Off – This message type displays a message dialog box with a user login form. A user with the required access level must select their username and enter their password to approve the current operation or action.

Text Entry - This message type displays a message dialog box with a text entry field. The text entered in the field can be parsed and evaluated in the same manner as COM Port input types. Further explanation of the text parsing options can be found in the "Data Settings" section under the "COM Port" input type (pages 44 and 45). This message type can be used to traceability data (such as a serial number) when a barcode scanner is not available.

“Message Class”– This dropdown selects the color styling of the message (not available for “User Sign Off” type messages, which default to “Info” class).

Info– Blue colored message styling

Error– Red colored message styling

Warning– Yellow/Gold colored message styling

Success– Green colored message styling

“Message Title”– This entry field specifies the text that is displayed in the header portion of the dialog message box (not available for “Action Button” type messages, replaced with “Button Prompt” field).

“Message Text”– This entry field specifies the text displayed in the primary message body of the dialog message box (not available for “Action Button” type messages, replaced with “Status Text” field).

“Required Access Level”– (User Sign Off message types only) This dropdown selects the minimum access level a user must have to successfully approve the User Sign Off. Access levels are listed from highest access level to lowest.

“Button Prompt”– (Action Button message types only) This entry field specifies the text displayed in the main button area of the action button.

“Status Text”– (Action Button message types only) This entry field specifies the text displayed in the status box area below the action button.

“When Response =” / “When User Sign Off Is”– This dropdown selects which message response causes the “When” operation to evaluate to “true”. The options in this dropdown will vary based on the “Message Type” selected. Certain message types will only have one option available.

Preview- Pressing this button will open a preview of the message based on the settings selected in the “Message Editor”.

Clearance Move– This input type is used to move to the tool clearance height of the currently loaded connector press independent from the currently loaded press (when a press step is executed, the press will move to tool clearance or prompt the user to move to tool clearance by default).

"Speed"– This entry field specifies the speed at which the press will move to clearance.

Measure Board– This input type is used to automatically measure the thickness of the board being pressed using the press head. This board measurement will override the board thickness programmed in the sequence editor.

"Measure Board Settings"– This button opens the Meaure Board Settings window (see Figure 47) where settings for the board measurement can be entered. Selecting "OK" will store the settings entered, and selecting "Cancel" will discard changes to the settings.

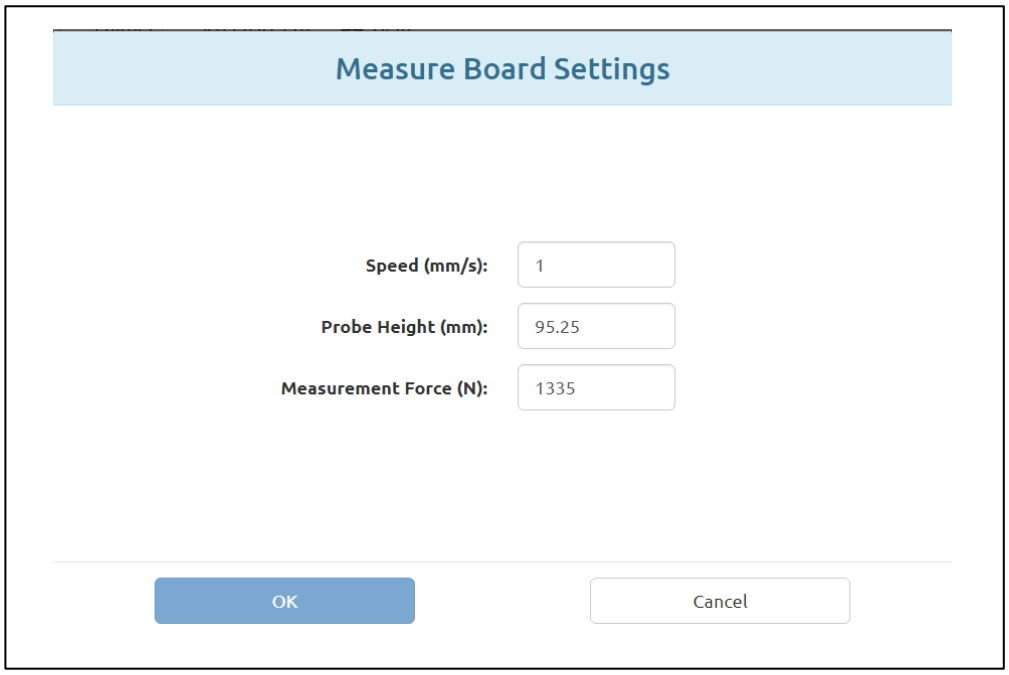

Figure 47

"Speed"– This entry field specifies the movement speed of the press head while performing the board measurement.

"Probe Height"– This entry field specifies the height of the measurement probe used to measure board thickness.

"Measurement Force"– This entry field specifies the force the press will apply to the measurement probe while taking the board measurement.

Digital Input– This input type is used to read the status of one of the machine digital inputs.

"Number"– This dropdown selects which Digital Input channel to read. All available inputs will be listed in the dropdown.

"Input State"– This dropdown selects the input state that the "When" operation will look for. When this input state is met, the "When" operation will evaluate to "true". The input state can be either "1" (on), or "0" (off).

COM Port– This input type is used to read input data from USB serial COM port devices connected to the machine. This is typically used for reading and acting on data from barcode scanners.

“COM Port Settings”– This button opens the “When” COM Port Settings window (see Figure 48) where communication settings for the COM port device can be entered. Selecting “OK” will store the settings entered, and selecting “Cancel” will discard changes to the settings.

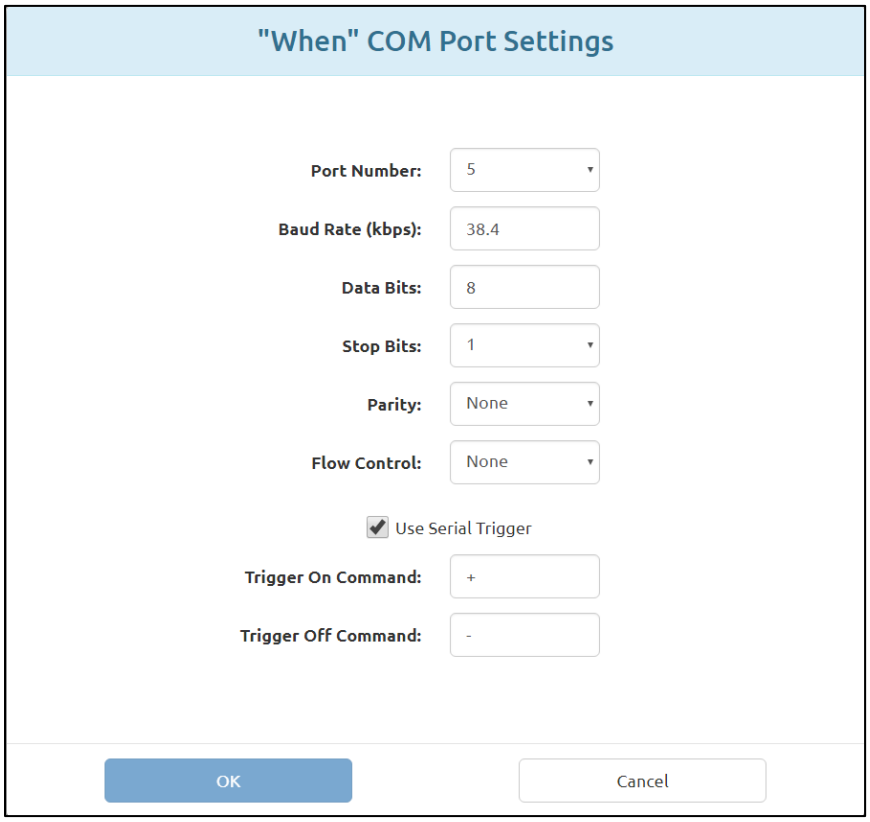

Figure 48

“Port Number”– This dropdown selects which COM port device to read. Only available COM ports will be listed.

“Baud Rate”– This entry field specifies the baud rate in kbps to use when communicating with the COM port device.

“Data Bits”– This entry field specifies the number of data bits contained in each message frame received from the COM port device.

“Stop Bits”– This dropdown selects the number of stop bits used in each message frame received from the COM port device.

“Parity”– This dropdown selects the type of parity (if any) used in each message frame received from the COM port device.

“Flow Control”– This dropdown selects the type of flow control (if any) used in each message frame received from the COM port device.

“Use Serial Trigger”– Selecting this checkbox will cause a serial trigger command to be sent to the device before attempting to read data from the COM port. This is used for scanners and other devices that will not send data unless they are triggered or queried. In this case the read operation will occur as follows:

Send “On” Command → Read Data From Device → Send “Off Comand

“Trigger On Command”– (Only used when “Use Serial Trigger” enabled) This entry field specifies the character sequence that will be sent to the COM port device to trigger or query the device to start sending data.

“Trigger Off Command”– (Only used when “Use Serial Trigger” enabled) This entry field specifies the character sequence that will be sent to the COM port device to stop the device from sending data after a read is complete.

“Data Settings”– This button opens the “When” COM Data Settings window (see Figure 49) where settings for reading and parsing data from the COM port device can be entered. Selecting “OK” will store the settings entered, and selecting “Cancel” will discard changes to the settings.

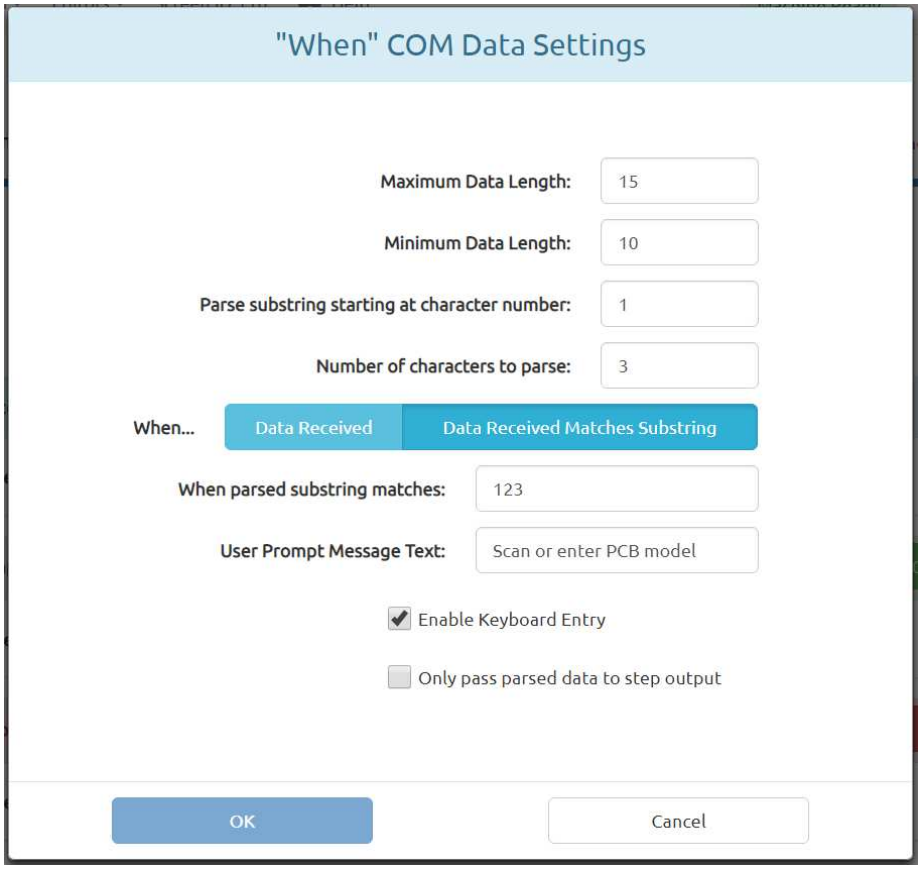

Figure 49

“Maximum Data Length”– This entry field specifies the maximum number characters to read from the device.

"Minimum Data Length"- This entry field specifies the minimum number of characters that must be read from the device for a successful scan.

“Parse substring starting at character number”– This entry field specifies where in the read data to start parsing characters. This is useful in some cases where the user may only want to analyze a portion of the total data read from the device. For example, if a “3” is entered into this field and the data string “SN123456” is read from the device, the first character parsed would be “1”.

“Number of characters to parse”– This entry field specifies how many characters from the read data to parse, starting from character number specified in the “Parse substring starting at character number” field. This is useful in some cases where the user may only want to analyze a portion of the total data read from the device. The sum of the number of characters to parse and the start character number cannot exceed the minimum data

length. For example, if a “4” is entered into this field, the start character number is “3” and the data string “SN123456” is read from the device, the parsed substring would be “1234”.

“Data Received” / “Data Received Matches Substring”– This toggle selects how the “When” operation will evaluate to “true”. If “Data Received” is selected, the “When” operation will evaluate to “true” whenever data is received, regardless of what the data contains. If “Data Received Matches Substring” is selected, the “When” operation will only evaluate to “true” if the parsed substring from the received data matches the substring entered in the “When parsed substring matches” entry field. This option is useful in cases where the press sequence needs to verify a specific tool ID number or the part or model number for a board or connector.

“When parse substring matches”– (Only visible when “Data Received Matches Substring” is selected) This entry field specifies the substring that the “When” operation will compare to the parsed substring read from the COM port device.

“User Prompt Message Text”– This entry field specifies the text to display in the message dialog box that is shown while waiting to read data from the COM port device.

“Enable Keyboard Entry”– Selecting this check box allows the user to enter data using the onscreen keyboard as an alternative to reading data from the COM port device. When this is enabled, the condition will use whatever data is received or entered first.

Move Shuttle– (Only available if shuttle enabled) This input type is used to move the shuttle to a designated position independent of the connector pressing operation. When the Shuttle is enabled for a connector press in the sequence editor, the shuttle to “press” and “load” positions is done as part of the pressing operation.

“Shuttle Position”– This dropdown selects the shuttle position that the condition will move the shuttle to. Available positions will be based on the shuttle type selected in the Machine Configuration.

PPS Tool– (Only available if PPS Tool enabled) This input type is used to send a command to the PPS Tool and act on its response independent of the connector pressing operation. If “PPS” is enabled for a connector in the sequence editor, the standard PPS tool checks are performed as part of the pressing operation.

“Command” – This dropdown selects which command to send the PPS Tool. Available commands will be based on the PPS tool type (certain commands may not be available when using older legacy PPS tools).

“Command Settings” – This button opens the “When” PPS Settings window (see Figure 50). This window is used to set how the “When” operation should evaluate to “true” and which command data to send for “Set” PPS commands. The settings options will vary base on the “Command” selected. “Set” PPS commands will always cause the “When” operation to evaluate to “true” as long as a valid response is received and no errors occur.

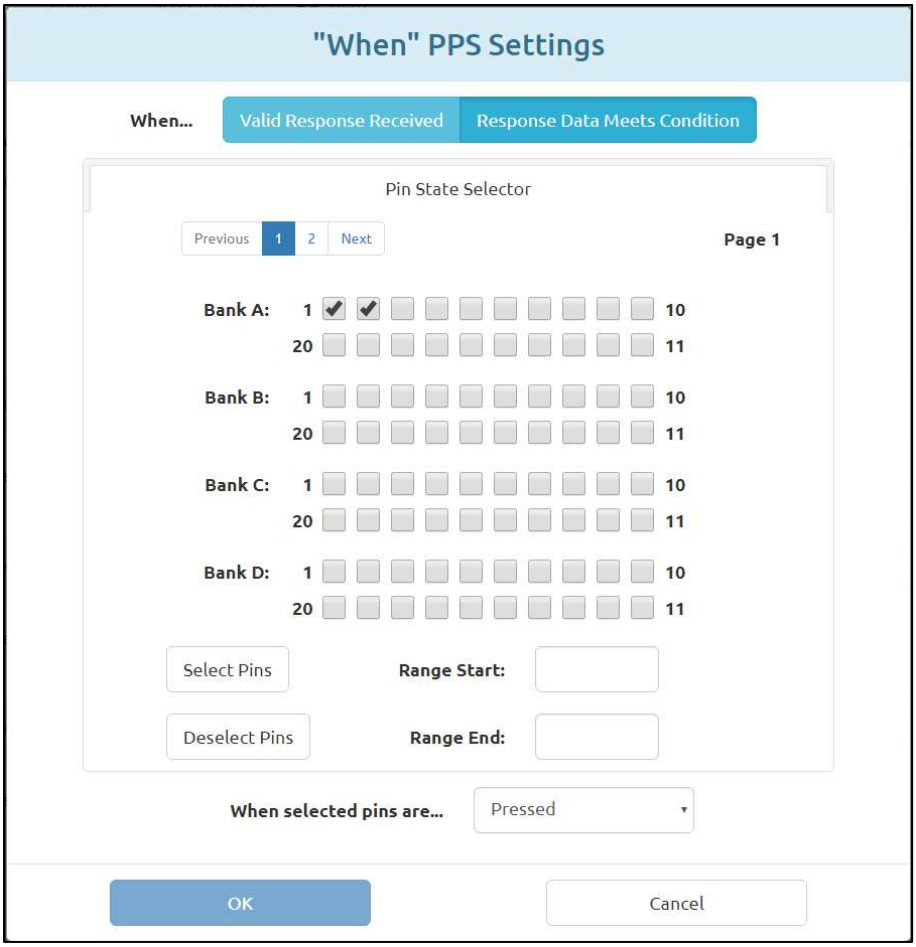

Figure 50

“Valid Response Received” / “Response Data Meets Condition”– (Only used for “Get” type PPS commands) This toggle selects how the “When” operation should evaluate to “true”. If “Valid Response Received” is selected, the “When” operation will complete as “true” as long as no communication errors occur when communicating with the PPS tool, regardless of the data that is received back from the tool. If “Response Data Meets Condition” is selected, the “When” operation will complete as “true” only if the data received back from the PPS tool matches certain criteria specified by the user.

“When Pass/Fail Status =” – (Only available for “Get Pass Fail” command when “Response Data Meets Condition” is selected) This dropdown selects which type of PPS pass/fail response should cause the “When” condition to evaluate to “true”.

“Pass data for pins that are…” – (Only available for “Get Pin States” and “Get Pin Mask” commands when “Valid Response Received” is selected) This dropdown selects whether data for pressed or not pressed pins should be passed on to the “Then” operation of the condition.

Pin State Selector– (Only available for “Set Pin Mask” command and for “Get Pin States”, “Get Pin Mask” commands when “Response Data Meets Condition” is selected) This tab allows the user to specify what type of pin data the “When” operation will look for to evaluate to “true” (for “Get” commands), or which pins will be included in the current pin mask (for “Set Pin Mask” command).

Pin Checkboxes– Each checkbox represents a pin in the PPS tool. Selecting a checkbox will add the pin to the list of pins that will be evaluated or sent by the “When” operation. For “Get” commands, pins that are not included in the current pin mask cannot be selected.

Select Pin Range– The “Select Pins” and “Deselect Pins” buttons can be used in conjunction with the “Range Start” and “Range End” entry fields to quickly select or deselect a large number of pin checkboxes. All pin numbers from “Range Start” to “Range End” will be selected or deselected when the corresponding button is pressed. For “Get” commands, pins that are not included in the current pin mask cannot be selected.

“When selected pins are…”– (Only available for “Get Pin States” and “Get Pin Mask” commands when “Response Data Meets Condition” is selected) This dropdown selects whether the “When” operation will evaluate the selected pins based on whether they are pressed or based on whether they are not pressed.

“When active mask number = ” – (Only available for “Get Active Mask” command when “Response Data Meets Condition” is selected) This dropdown selects which active mask number response should cause the “When” condition to evaluate to “true”.

“When Serial Number = ” – (Only available for “Get Serial Number” command when “Response Data Meets Condition” is selected) This entry field specifies which serial number response should cause the “When” condition to evaluate to “true”.

“When Boilerplate = ” – (Only available for “Get Boilerplate” command when “Response Data Meets Condition” is selected) These entry field specifies which boilerplate response should cause the “When” condition to evaluate to “true”.

“When Page Count = ” – (Only available for “Get Page Count” command when “Response Data Meets Condition” is selected) This entry field specifies which page count response should cause the “When” condition to evaluate to “true”.

“When Pin Logic = ” – (Only available for “Get Pin Logic” command when “Response Data Meets Condition” is selected) This dropdown selects which pin logic type response should cause the “When” condition to evaluate to “true”.

“Set Pin Logic to” – (Only available for “Set Pin Logic” command) This dropdown selects which pin logic type the PPS tool will use.

“Set Active Mask to” – (Only available for “Set Active Mask” command) This dropdown selects which active mask the PPS tool will be set to use.

Clock Icon Button– This button opens the “When” Time Settings window (see Figure 51). If no settings are entered in this window, default “Timeout” and “Polling Interval” values will be used based on the “Input Type” selected.

“Timeout” – This entry field specifies the time in milliseconds that the “When” operation will wait to evaluate as “true” before timing out and evaluating as “false” and performing the “Else” operation. A value of 0 will cause the “When” operation to wait indefinitely.

“Polling Interval” – This entry field specifies how often in milliseconds the “When” operation will evaluate the operation to see if it has a “true” result. This value should be less than or equal to the “Timeout” value. For example, if the “When” operation is checking whether a digital input has been switched on and the “Polling Interval” value is “20”, the digital input will be checked once every 20 milliseconds to determine whether the input has been switched on and the operation should evaluate to “true”.

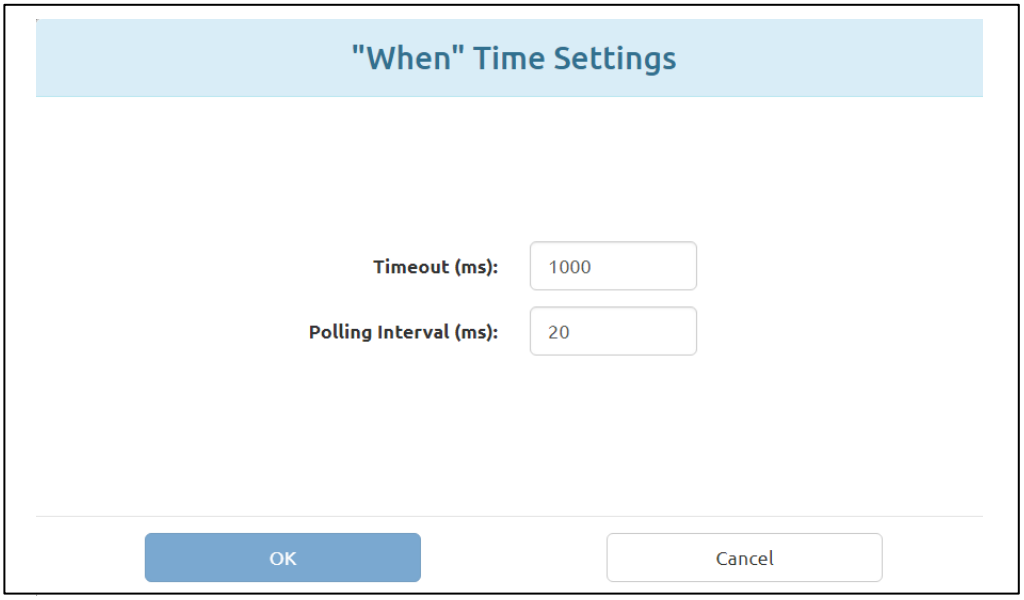

Figure 51

“Then” and “Else” boxes – Entries within these boxes define and describe the “Then” and “Else” output operations of the current condition step. The “Then” operation will occur if the “When” operation evaluates as “true”. The “Else” operation will occur if the “When” operation evaluates as “false” or times out.

“Output Type”– This dropdown selects the type of output operation to perform for this condition step operation. Available output types are “Step Complete”, “Message”, “Clearance Move”, “Digital Output”, “COM Port”, “Move Shuttle”, and “PPS Tool”.

Step Complete – This output type is used to make the output operation complete immediately according to the selected completion “Action” without performing any additional tasks. This is useful for conditions that are performing a simple check in the “When” operation or for multi-step conditions that are checking multiple inputs.

Message– This output type is used to display a message to the screen via a dialog box or the production action button, or to clear or close existing messages on the screen. This output type is useful for providing status updates or clearing old messages.

“Message Editor”– This button opens the “When” Message Editor window used to customize the message display. To keep the changes made in this window, click “OK”. To discard any changes made in this window, click “Cancel”.

“Message Type”– This dropdown selects the type of message to display. The available message types are

Acknowledge – This message type displays a message dialog box with a single “OK” button for the user to acknowledge the message.

Disabled Action Button – This message type disables the action button and displays a message to the production action button and action button status box. This type is useful for showing the current machine operation while also preventing the user from interrupting the operation by pressing the action button. The user can still leave the screen or interact with the screen in other ways.

Info – This message type displays a message dialog box no buttons. This message box effectively locks the screen until a subsequent condition step closes the message. This message type is useful for completely preventing the user from interacting with the machine until certain operations are completed.

Close Messages – This message type closes any open message dialog boxes on the screen.

Clear Action Button – This message type clears any specialized messages (messages displayed using a “Condition”) from the production “Action” button and status box.

“Message Class”– This dropdown selects the color styling of the message (not available for “Close Message” or “Clear Action Button”).

Info– Blue colored message styling

Error– Red colored message styling

Warning– Yellow/Gold colored message styling

Success– Green colored message styling

“Message Title”– (only available for “Acknowledge” and “Info” type messages) This entry field specifies the text that is displayed in the header portion of the dialog message box.

“Message Text”– (only available for “Acknowledge” and “Info” type messages) This entry field specifies the text displayed in the primary message body of the dialog message box. The “${data}” variable can be used in the message text to display any result data passed from the “When” operation (if enabled).

“Button Prompt”– (Disabled Action Button message types only) This entry field specifies the text displayed in the main button area of the action button.

“Status Text”– (Disabled Action Button message types only) This entry field specifies the text displayed in the status box area below the action button.

**“Display data passed from “When” result using ${data} variable”–** This checkbox enables the data display feature that allows result data from the “When” operation to be displayed in the message text using the “${data}” variable (not available for “Close Message” or “Clear Action Button”).

Preview- Pressing this button will open a preview of the message based on the settings selected in the “Message Editor”

Clearance Move– This output type is used to move to the tool clearance height of the currently loaded connector press independent from the currently loaded press (when a press step is executed, the press will move to tool clearance or prompt the user to move to tool clearance by default).

“Speed”– This entry field specifies the speed at which the press will move to clearance.

Digital Output– This output type is used to set the status of one of the machine digital outputs.

“Number”– This dropdown selects which Digital Output channel to set. All available outputs will be listed in the dropdown.

“Output State”– This dropdown selects the output state that the “Then”/”Else” operation will set the specified output to. The output state can be either “1” (on), or “0” (off).

COM Port– This output type is used to send output data to USB serial COM port devices connected to the machine.

“COM Port Settings”– This button opens the “Then”/”Else” COM Port Settings window where communication settings for the COM port device can be entered. Selecting “OK” will store the settings entered, and selecting “Cancel” will discard changes to the settings.

“Port Number”– This dropdown selects which COM port device to send data to. Only available COM ports will be listed.

“Baud Rate”– This entry field specifies the baud rate in kbps to use when communicating with the COM port device.

“Data Bits”– This entry field specifies the number of data bits contained in each message frame sent to the COM port device.

“Stop Bits”– This dropdown selects the number of stop bits used in each message frame sent to the COM port device.

“Parity”– This dropdown selects the type of parity (if any) used in each message frame sent to the COM port device.

“Flow Control”– This dropdown selects the type of flow control (if any) used in each message frame sent to the COM port device.

“Data Settings”– This button opens the “Then”/”Else” COM Data Settings window where settings for sending data to the COM port device can be entered. Selecting “OK” will store the settings entered, and selecting “Cancel” will discard changes to the settings.

“Message Data” - This entry field specifies data character string that will be sent to the COM port device.

Move Shuttle– (Only available if shuttle enabled) This output type is used to move the shuttle to a designated position independent of the connector pressing operation. When the Shuttle is enabled for a connector press in the sequence editor, the shuttle to “press” and “load” positions is done as part of the pressing operation.

“Shuttle Position”– This dropdown selects the shuttle position that the condition will move the shuttle to. Available positions will be based on the shuttle type selected in the Machine Configuration.

PPS Tool– (Only available if PPS Tool enabled) This output type is used to send a command to the PPS Tool independent of the connector pressing operation. If “PPS” is enabled for a connector in the sequence editor, the standard PPS tool checks are performed as part of the pressing operation.

“Command” – This dropdown selects which command to send the PPS Tool. Available commands will be based on the PPS tool type (certain commands may not be available when using older legacy PPS tools).

“Command Settings” – (Only available for “Set” commands) This button opens the “Then”/”Else” PPS Settings window. This window is used to specify which command data to send for “Set” PPS commands. The settings options will vary base on the “Command” selected.

Pin State Selector– (Only available for “Set Pin Mask”) This tab allows the user to specify which pins will be included in the current pin mask.

Pin Checkboxes– Each checkbox represents a pin in the PPS tool. Selecting a checkbox will add the pin to the list of pins that will sent to the PPS Tool.

Select Pin Range– The “Select Pins” and “Deselect Pins” buttons can be used in conjunction with the “Range Start” and “Range End” entry fields to quickly select or deselect a large number of pin checkboxes. All pin numbers from “Range Start” to “Range End” will be selected or deselected when the corresponding button is pressed.

“Set Pin Logic to” – (Only available for “Set Pin Logic” command) This dropdown selects which pin logic type the PPS tool will use.

“Set Active Mask to” – (Only available for “Set Active Mask” command) This dropdown selects which active mask the PPS tool will be set to use.

Clock Icon Button– This button opens the “Then”/”Else” Time Settings window. If no settings are entered in this window, default “Duration” values will be used based on the “Output Type” selected.

“Duration” – This entry field specifies the time in milliseconds that the operation will executed the output operation. The most common use of this would be to pulse or set a digital output to a certain state for a limited amount of time. A value of “0” can be used to set an indefinite duration.

“Then”/”Else” Complete Action– This dropdown selects how the respective output operation will complete after performing its task (see Figure 52). There are four possible completion “Actions”.

Complete: After executing the “Then” or “Else” operation, the condition will complete successfully and the next step in the press sequence will execute.

Error: After executing the “Then” or “Else” operation, the condition will complete and abort the press sequence. The first step in the press sequence will be loaded and executed.

Next Step: (Only available for multi-step conditions) After executing the “Then” or “Else” operation, the next step in the condition will be executed.

Goto Step *n*: (Only available for multi-step conditions) After executing the “Then” or “Else” operation, step *n* in the condition will be executed.

Figure 52

JavaScript Viewer Tab – (Hidden for most users) This tab contains a read-only text window that can be used to view the script that is generated by the condition steps specified in the “When/Then/Else Editor” tab. This is primarily useful for advanced debug and analysis of a condition.

D. **Examples**

Measure Board Thickness – This condition implements a commonly used board pressing feature that measure the circuit board thickness using a measurement probe. Standard Template Conditions cannot be modified (see Figure 53), but they can be copied, modified, and saved under a different name as needed.

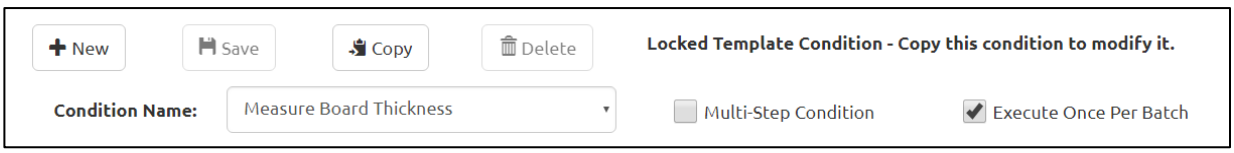

Figure 53

One common modification to the “Measure Board Thickness” condition is toggling the “Execute Once Per Batch” option (see Figure 54) on or off based on how often board thickness should be measured for the users application. Toggling the option off will cause board measurement to occur for every board pressed. When the option is on, board measurement will only occur for the first board pressed in the batch. Reloading the press sequence will start a new batch.

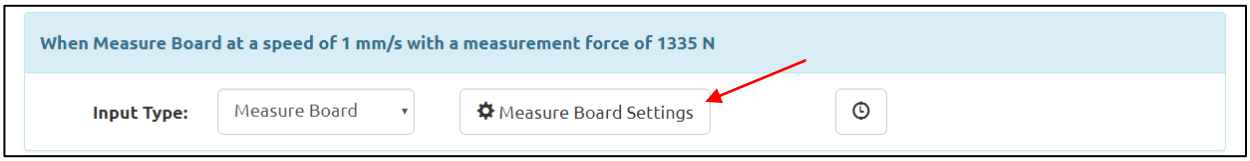

Figure 54

Another common modification to the “Measure Board Thickness” condition is to adjust the measurement “Probe Height” to the correct height based on the measurement probe being used (see Figure 55). The “Probe Height” can be adjusted by pressing the “Measure Board Settings” button in the “When” operation box and entering a new value in the settings window.

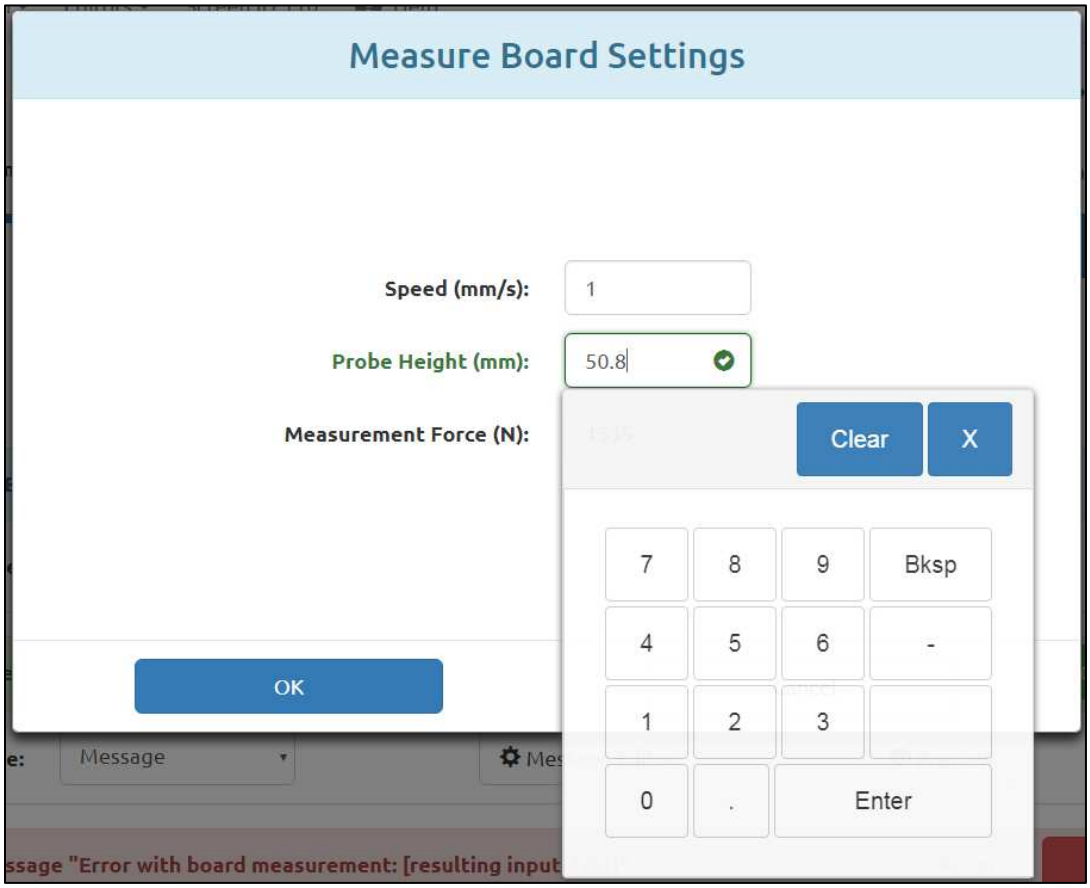

Figure 55

PCB Verify – The PCB Verify condition requires the operator to scan or enter the board part number or model number for verification prior to pressing the board. This Standard Template Condition and others that involve a barcode scanner often need to be modified to accommodate the specific scanner. The model number that the PCB will be verified against also must be customized.

To modify the standard PCB Verify condition, “Copy” the condition, rename it, and save it under a new name. Open the “COM Port Settings” window by pressing the corresponding button in the “When” operation box (see Figure 56). Select the appropriate “Port Number” (see Figure 57) for the barcode scanner being used (the list of available COM Port devices can be refreshed on the system settings screen). Modify the other COM Port Settings as needed to work with the barcode scanner.

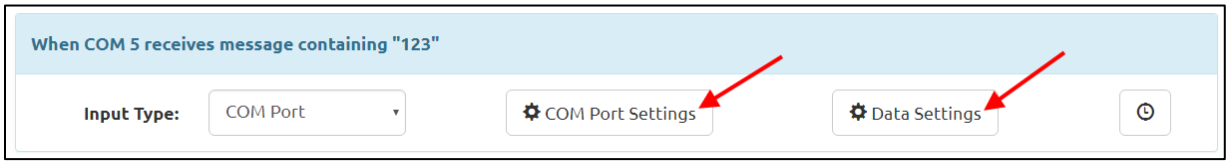

Figure 56

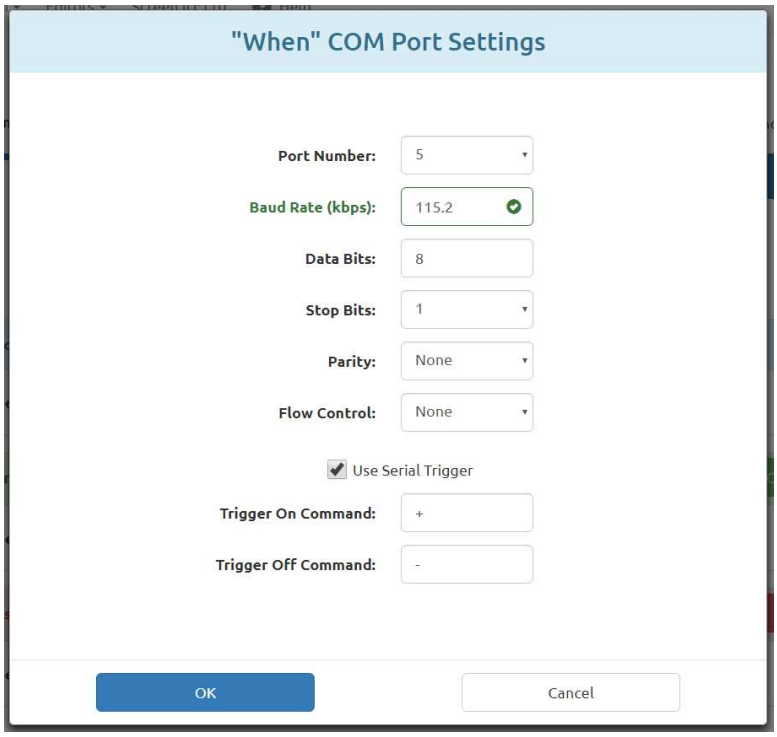

Figure 57

Enter the custom model number to verify by opening the “COM Data Settings” window using the corresponding button in the “When” operation box (see Figure 56). Edit the data settings fields accordingly for the model number that is being parsed (see Figure 58).

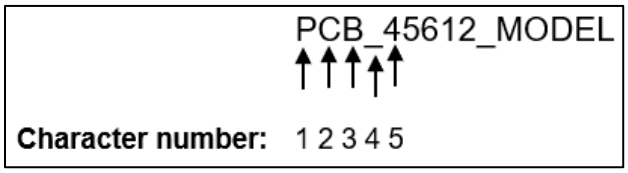

Figure 58

For example, assume the format of the model numbers being scanned is “PCB_XXXXX_MODEL” and the correct board model number is “45612”. This means the correct model number string will be “PCB_45612_MODEL”. The portion of the model number string that must be parsed out starts at character number 5, so “5” is entered into the “Parse substring starting at character number” field. Because the model number is 5 digits long, “5” is entered into the “Number of characters to parse” field as well. Because at least 9 digits are required to read the full model number, "9" will be entered into the "Minimum Data Length" field. Finally, “45612” is entered into the “When parse substring matches field” since that is the exact substring from the model number that must be verified (see Figure 59).

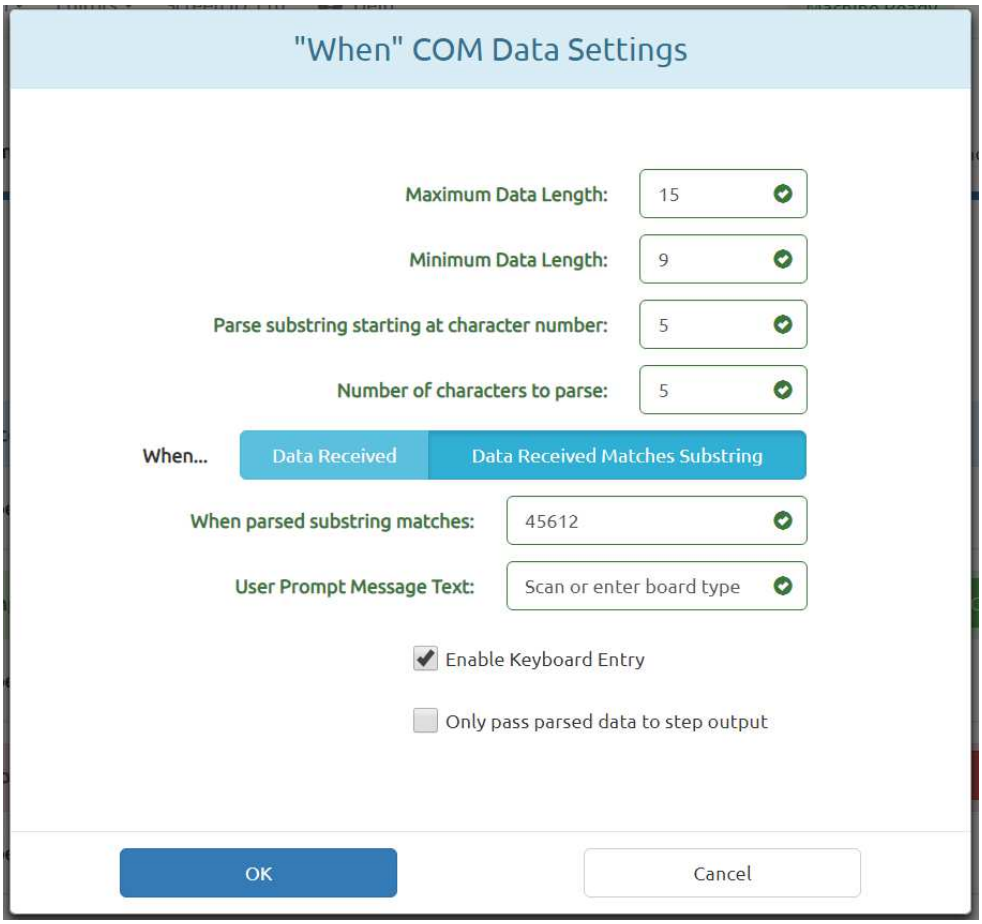

Figure 59

8.5. Sequence Editor

A. Purpose

The Sequence Editor (Figures 52, 53, and 54) is used to enter and store the data about the board (including board physical characteristics and connector locations) and the pressing sequence. All connectors and conditions to be used on the board being programmed must be defined in the connector or condition database before the press data file can be generated.

The Sequence is saved in an sqlite database. When generating a new press program, it may be convenient in some cases to open an existing press file and do a “Copy” to duplicated the Sequence and a “Save” to store the sequence under a new sequence name.

B. Entries

NOTE
Not all entries described are applicable to every type of press.

“Revision” - This is the revision level of the board to be pressed, or alternatively the revision of the Press Sequence program. It is used as reference in this file only.

Board Dimensions Tab

“Board Width” - This is the dimension of the board in the X axis direction (left to right) as normally positioned in the machine. It may or may not be the smaller board dimension. For manually positioned presses, this dimension is only used for drawing the board.

“Board Length” - This is the dimension of the board in the Y axis direction (front to back) as normally positioned in the machine. It may or may not be the larger board dimension. For manually positioned presses, this dimension is only used for drawing the board.

“Board Thickness” - This is the nominal board thickness which is used to calculate the connector pressed height. If the board thickness measurement option is selected, the measured thickness will be used instead.

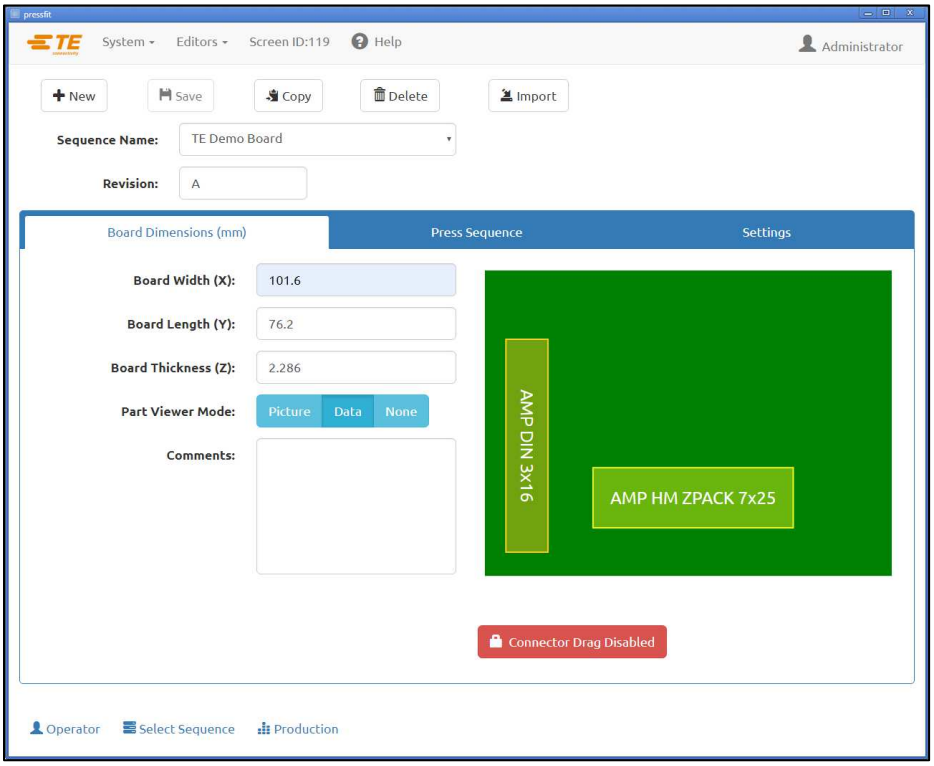

Figure 60

“Part Viewer Mode” – The part viewer mode determines the type of board display shown during runtime.The part viewer is also display in the sequence editor next to the board dimensions entry field.

● Picture – This option uses a picture from a digital camera or scan of a photograph to show the board being pressed. The connector position and angle information entered into the Sequence tab is used to generate connector image overlays on the board picture.

● Data– This option creates an image from the X, Y, angle, and connector data to display at runtime. Connector information is entered into the Sequence tab. The Sequential mode pressing sequence follows the order of the connectors in the Seqeunce tab.

● None –No image of the PCB is displayed on the screen in Run mode. Instead, a list of the connectors on the PCB is displayed along with their associated tools. Instead of using the “Goto” runtime function, the next connector to press is chosen by clicking on the list. This option may be useful when performing PCB repair operations.

“Comments” - This is a general description of the board to be pressed. It is used as reference in this file only.

“Connector Drag Enabled/Disabled” – Toggle this button to “Enabled” to allow the user to drag and drop connectors in the part viewer to set their x and y location on the board. To prevent accidental modification of connector locations, toggle the button to “Disabled”.

Settings Tab

“Fixture Thickness” - This is the thickness of the fixture or “platen” that supports the board. It must be accurately measured in order for press to height to be accurate.

“Fixture ID” – This feature is intended to verify that the correct fixture (support platen) is used with the PCB. Entering text into this field does not change anything operationally with the press sequence, but may be useful for traceability and identifying press sequences for MES systems.

Verification of the fixture ID can be added to the press sequence using the “Verify Fixture ID” condition from the condition database. Initial setup of this condition must be performed by TE field service personnel.

“Prompt for Connector Substitution” – This check box enables substitution connectors to be selected at run time. For example, manufacturer “A” may be the prime source for a given connector, but “B” is also approved as interchangeable on this board. If this box is checked, the operator will be offered a selection of possible alternates for the connector at run time. Their selection will drive the tool and profile selected for pressing that connector.

Thus, it is possible to press an alternate connector that requires a different tool and different profile than the primary connector. The alternates are associated with each other by “substitution codes” that are defined in the connector database. The associated connectors are individually entered into the database, but they are “linked” by a common substitution code. See the connector editor for details on entering connector substitution codes.

“Connector Name as Label” – When this feature is checked, each connector’s Name text (from the connector database) will be displayed with the connector number on each connector in the runtime PCB drawing. This option takes priority over the “Use Connector Message as Label” option.

“Use Connector Message as Label” – When this feature is checked, the text entered in the Message field for each connector position will be displayed with the sequence number on each connector in the runtime PCB drawing.

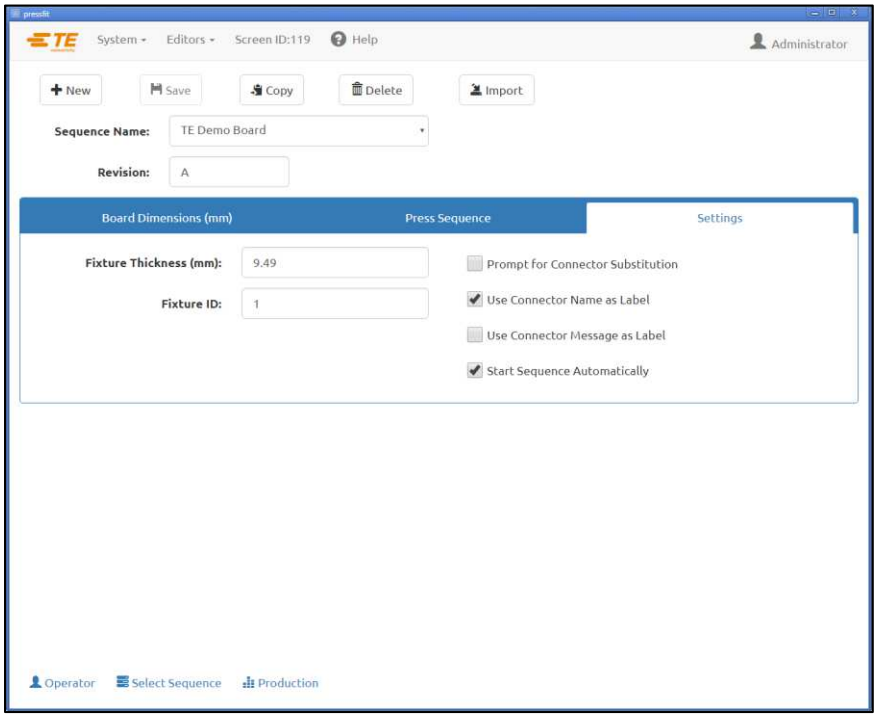

Figure 61

“Start Sequence Automatically” – When this feature is checked, the press sequence will start automatically upon enter the “Production” screen. This feature is typically used for most multi-connector pressing sequences in order remove the extra button press needed to start each board pressing sequence.

Press Sequence Tab

Pressing Order – The mode chosen determines if the pressing sequence follows the order of the connectors entered or is determined by the operator at runtime.

● Sequential – The pressing sequence follows the order of the connectors in the Press Sequence.

● Non-Sequential – The operator must select the next connector to press at runtime. In Digital Picture or Data Image mode, this is done with the “GoTo” runtime function. When Image Mode is “None”, the operator chooses the connector type to press from a list. The press will press this same connector each time until the operator chooses another one. This mode is often used for PCB repair activity.

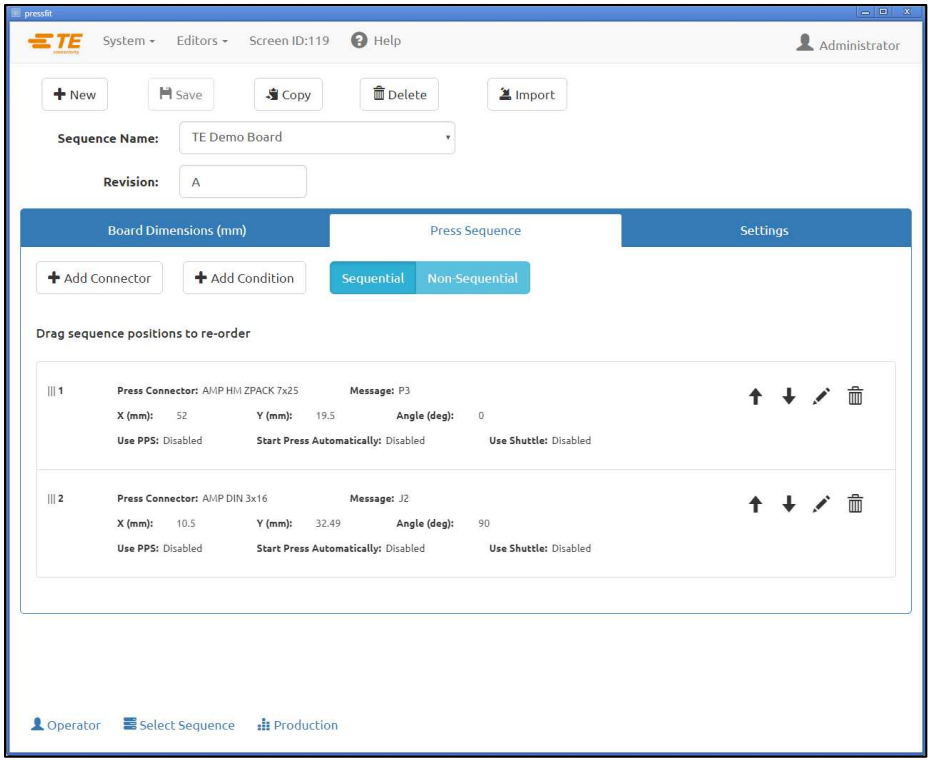

Figure 62

“Add Connector” – Pressing this button will add a connector to the current list of press sequence steps.

“Add Condition” – Pressing this button will add a condition to the current list of press sequence steps.

Step Editing Controls:

Save Step Button (Checkmark Icon) - Press this button to save the step to the press sequence after adding or editing a connector or condition.

Cancel Step Button (X Icon) – Press this button to cancel any changes made to the current connector or condition step. If the step is a new step, it will be removed from the press sequence.

Preview Button (Eye Icon) – Press this button to view a summary of the connector or condition currently selected for the step.

Delete Button (Trash Can Icon) – Press this button to delete a connector or condition step from the press sequence.

Move Step Up Button (Up Arrow Icon) – Press this button to swap a step with the step preceding it in the press sequence.

Move Step Down Button (Down Arrow Icon) – Press this button to swap a step with the step after it in the press sequence.

Edit Step Button (Pencil Icon) – Press this button to edit a connector or condition step in the press sequence.

"Connector" - The connector to be pressed is selected from the connector database by using the drop-down menu. All connectors to be used on the board must be defined in the connector database before the press data file can be generated. The pressing sequence follows the order of the connectors entered here, so thought should be given to optimize the movements. Connectors of one type should be pressed before proceeding to the next to minimize tool changes.

"Message" – User defined comment for future reference and reminder. These may be used as the text of user prompts for each connector and/or overlaid on the runtime PCB image to identify each connector.

"X, Y" - These entries define the position of the connector relative to the board's lower left corner. Each coordinate pair defines the location of the geometric center of the area that the pressing tool engages. This is generally the centroid of the connector, but in some cases it is not. These entries are only used for drawing the board and traceability data.

"Angle" - This defines the angle of the connector relative to the board mounted on the machine. Select the appropriate angle from the drop-down menu. Angles are defined with zero degrees to the right. The positive 90 degree position is ¼ turn counter clockwise as viewed from the top. The connector "pointer" for angles is the polarized end if defined. This dimension is only used for drawing the board and traceability data.

"Use PPS" – Selecting this option (if available) will enable the PPS tool for the connector step.

"Start Press Automatically" – Selecting this option will automatically start the pressing operation for this connector step when it is reached in the press sequence. This option is typically selected for single connector automated shuttle machine sequences where a button press to start the pressing cycle would delay cycle times.

"Use Shuttle" – Selecting this option (if available) will enable automated shuttle for the connector step.

"Condition" - The condition to be run is selected from the condition database by using the drop-down menu. All conditions to be used in the press sequence must be defined in the condition database before the press sequence can be generated.

8.6. SensiPress Optimization

A. Introduction

As the industry moves to high-performance connectors with higher pin densities and smaller pin tails, the ability to detect bent pins at the early stage of the pressing cycle is becoming more challenging. The high sensitivity measurement capabilities of SensiPress technology enables TE Connector press fit machines to more accurately measure press force and halt the seating cycle if it detects early contact with the tool, which may indicate that one or more pins are bent or out of alignment. TE Connectivity enhanced the detection of bent pins in connector press fit applications by reducing mechanical noise, thereby increasing accuracy, reducing scrap and simplifying troubleshooting and maintenance.

B. How it Works

The machine works by following a profile (series of steps) and analyzing the force and position data to determine the action at the end of each step. Each step has a force and height target. As it is moving to the target height it monitors the force. If the target force value is achieved before the target height is reached, the force action is taken. If the height is reached the height action is taken. Anomalies in the process are detected by having a step in the profile that looks for a given force in a specific height range.

The bent pin detection works the same way. It detects bent pins (or improperly pre-seated connectors) by looking for a low force value at a height range that is just above where the anvil normally makes contact with the tool and begins to build force. There is no new or special analysis associated with SensiPress. The addition of SensiPress has improved error detection by allowing the use of a much smaller force value (previously 50-100lbs, now 2-5lbs). That enables the detection of fewer and smaller bent or stubbing pins.

C. Bent Pin Error Detection

Machines will detect an error when force is detected in the “Early Contact Detection Zone”. With SensiPress Technology we are now able to detect early contact forces in the 2 - 5lbf (see Figure 63).

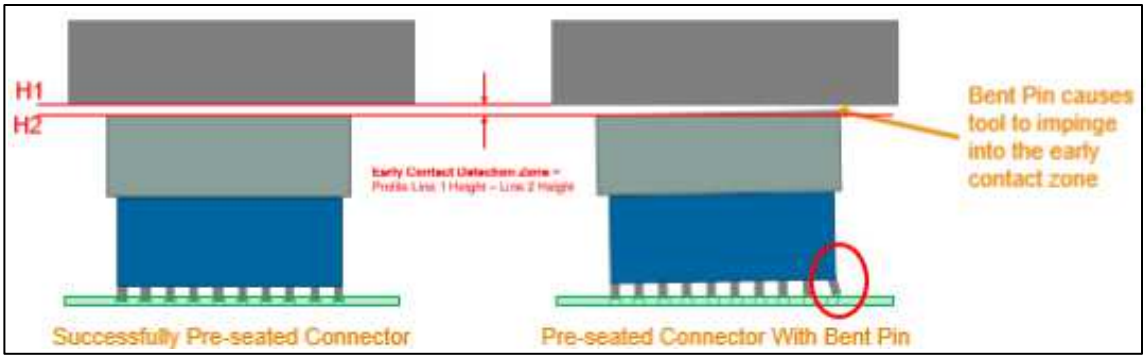

Figure 63

If the pin is bent too much, it will not generate force in the early contact detection zone and therefore will not be detected as an error. In cases like this, the overall difference in force will be well within the normal variation of the pressing process. Therefore, it will be undetectable with typical force analysis regardless of the sensitivity or accuracy (see Figure 64).

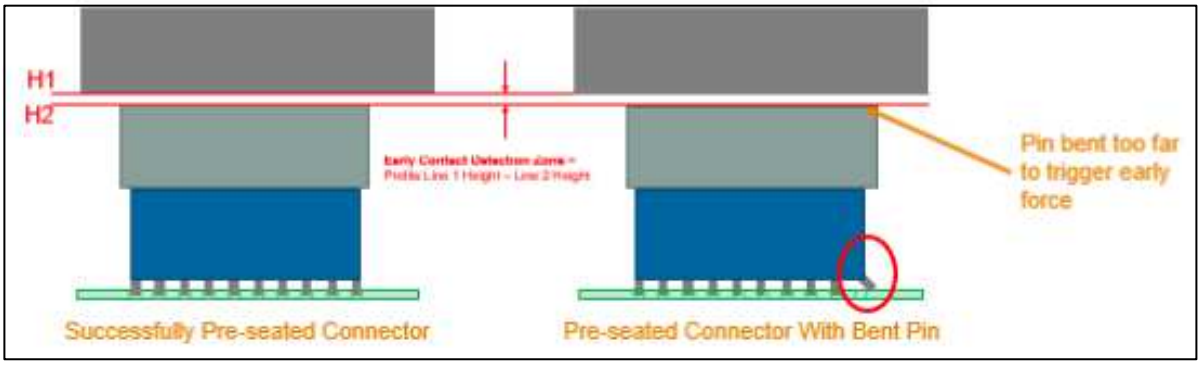

Figure 64

D. **Profile Set Up** (reference **Figure 65**)

1. Add Line 1 to the current connector Profile. The force for this line can be 25-50 lbs.
2. Make sure that Line 1 Unseated Tool Top +.xxxx value is at least .0500 greater than the Tool Clearance height (in Tool Editor).
3. Adjust Line 2 so that it can detect a bent pin very close to the unseated tool top. Use press data from good terminations to tune this value.
4. Line 1 and 2 determine the “Early Contact Detection Zone” .1-.035 gives us a range of .065” in which we are looking for an early contact force of 5 lbs. (as specified in line 2)

   The force in Line 2 can be adjusted to detect a bent pin. The CMP 5T can use an early detection force setting of as low as 1 lbf. However, it is recommended to start with 5 lbs. and adjust lower if needed.

Profile Step Sequence | Profile Step Editor | Legacy Profile Viewer

Step #	Height (in) Above Board	Height Action	Force (lb)	Force Action	Speed (in/s)	Name
1	Unseated Tool Top + 0.1	Next Step	25 lb	Error Premature Contact Detected	0.1	Move to Early Contact Detection Zone
2	Unseated Tool Top + 0.035	Next Step	5 lb	Error Premature Contact Detected	0.1	Test For Bent Pins
3	Seated Height + 0.04	Goto Step 6	Min Force/Pin * Number of Pins	Next Step	0.1	Test Missing or Repress
4	Seated Height + 0.01	Next Step	Max Force/Pin * Number of Pins	Error Excessive Force	0.197	Test within Seated Height
5	Seated Height - 0.02	Error Insufficient force	PARS from Connector Database	Complete seated	0.079	Seat Connector
6	Seated Height + 0.035	Next Step	350 lb	Error Min Force Per Pin Error	0.079	Check for Minimum Force per Pin
7	Seated Height - 0.022	Error Missing Connector	350 lb	Next Step	0.079	Test Missing
8	Seated Height + 0.01	Next Step	Max Force/Pin * Number of Pins	Error Excessive Force	0.079	Test Repress within Seated Height
9	Seated Height - 0.02	Error Insufficient Force	Max Force/Pin * Number of Pins	Complete Repress Complete	0.079	Seat Repress

Figure 65

E. **No Bent Pin** (reference **Figure 66**)

Figure 66

Adjust “Unseated top Tool + x.xxx” dimensions in Line 1 and Line 2 as needed to set the early contact zone to defect force just before the curve starts. A few test presses with no bent pins may be needed to tune the profile correctly.

F. **Bent Pin Press**

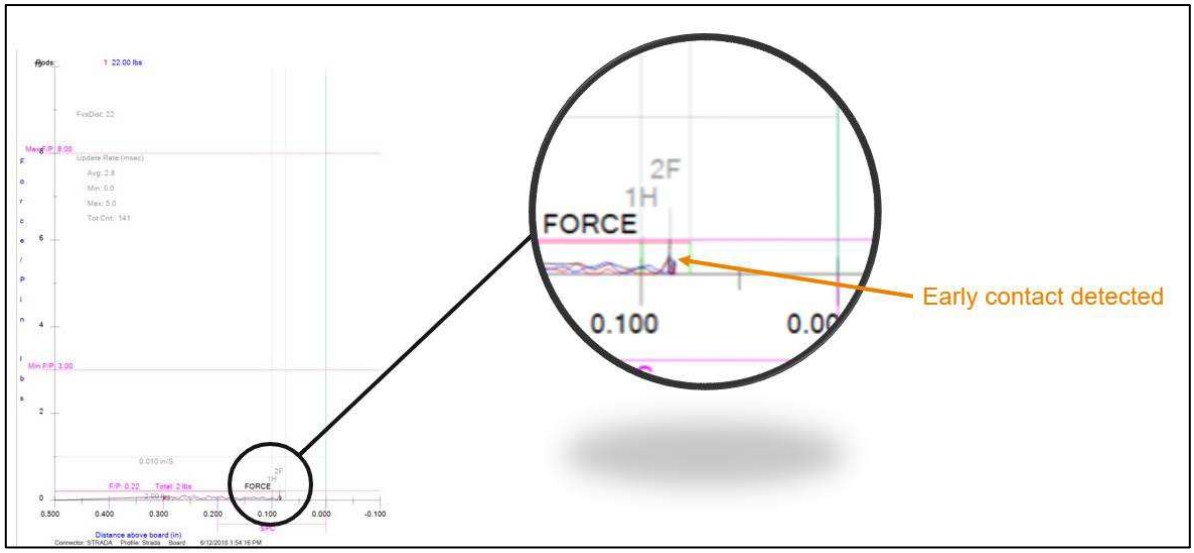

Figure 67

G. **Profile Optimization**

For best performance:

- It may be necessary to tailor a profile for each connector or family of connectors.
- The speed should not be changed between step 1 and 2. The inertia of the anvil can induce a force on the load cells during acceleration which could trigger a false early contact error.
- Speed can influence performance. Generally, slower speeds yield better performance.

H. **Other Factors**

- Because the bent pin detection is reliant on looking for a very small force in a narrow height range, anything that can have an impact on the overall stack height will influence reliability and functionality. Therefore, customers will want to eliminate sources of variation as much as possible.

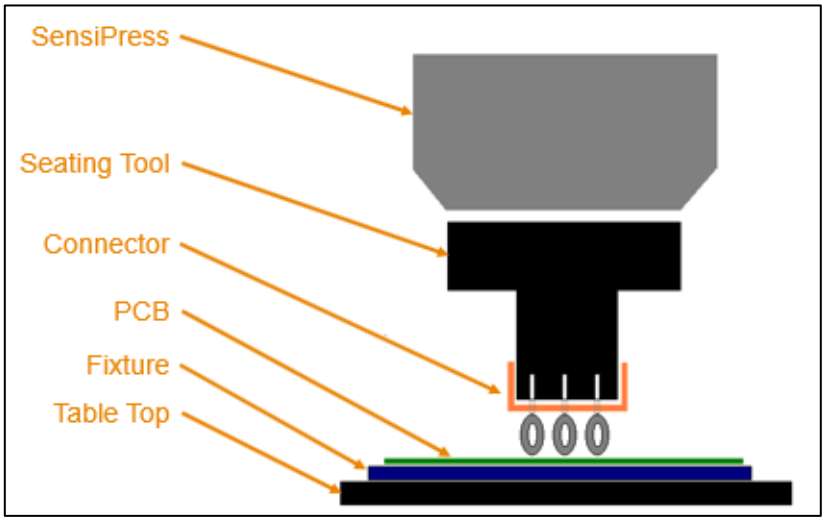

Figure 68

- Board & Fixture Flatness
  Any curvature in either the PCB or fixture will affect the height at which the pressing force begins. Curvature and variation in curvature will make it difficult to evaluate for bent pins. It can lead to both false positives and false negatives. The resolution is to raise the detection force or increase the H2 detection height which will limit the ability to detect bent pins.

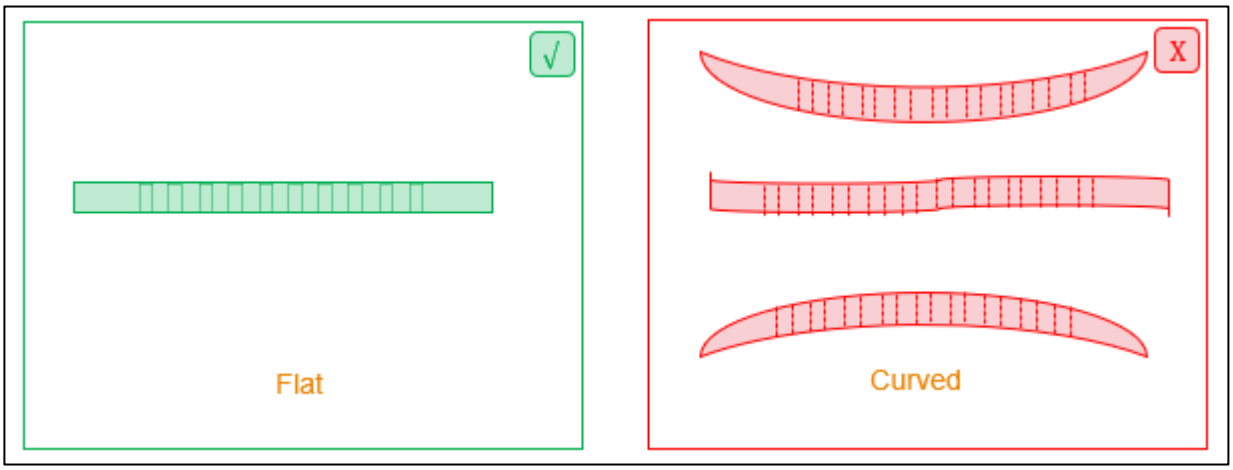

Figure 69

- Board Thickness Tolerance
  For optimal performance, PCB thickness variation should be minimal. If too large, the performance would be inconsistent. If excessive PCB thickness variation is a potential, use the Measure Board Thickness option in the press data editor to verify the thickness of the PCB.

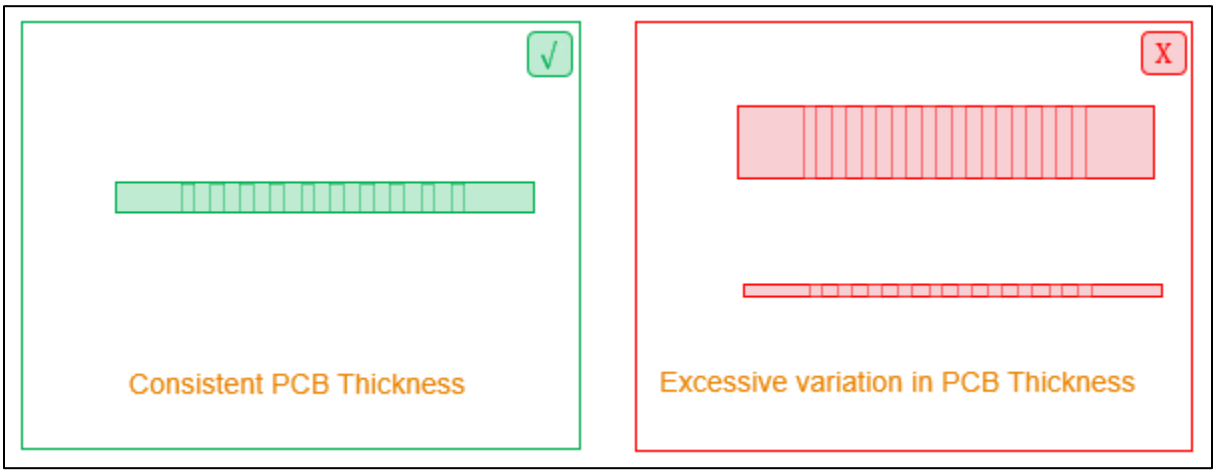

Figure 70

I. Tooling and Fixture Match Up

It is not recommended to use seating tools and fixtures interchangeably. If the customer has multiple copies of the same tool or fixture, it is recommended to dedicate the tooling combination to a specific machine and tune the profile on that machine to match the tooling.

An alternative option would be to apply a unique ID to each tool and fixture and then use the tool ID and Fixture ID fields in the software to verify that the correct tooling is used. They would have to create programs for every potential combination of tooling. Naturally, this could become complicated if there are numerous copies of the same tooling.

If neither of these options work, the alternative is to adjust the profile to be more tolerant of the variation which will make it less likely to detect bent pins.

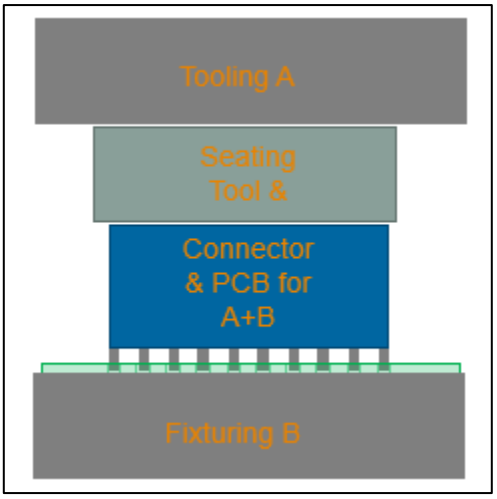

Figure 71

9. DIAGNOSTICS SCREEN

The press software provides maintenance utilities on the Diagnostics Screen as described below. The Diagnostics screen is found under the System drop-down menu.

9.1. Manual Control Panel

The Manual Control panel (see Figure 72) is used for servo setup, maintenance and troubleshooting purposes.

The left panel provides the joystick controls for manually operating the servo axis. The Power button toggles the main power ON or OFF to the amplifier through the safety circuits. The Home button initiates a sequence to initialize the motor position. The Speed field allows setting the servo movement speed in Diagnostics mode by typing a number into the box. The arrow up and arrow down buttons cause the head to move up or down. The increment field sets the distance increment that the press head will move each time the up or down jog buttons are pressed. Pressing the “Goto Position” button will move the press head to the position specified in the “Position” entry field. The progress bar on the right shows the current position of the press head relative to the upper and lower limits of the press.

The lower portion of the left panel shows both total machine force and individual load cell forces in force units and as a bar graph. The Max Force slider located below the force measurement bar graph sets the desired force limit for joystick operation. The Max Force entry field can be used to enter an exact max force limit. When the total force approaches this limit, the force bar graphs change to a yellow color. When the limit is exceeded, the bar graphs turn red and further downward motion is inhibited. When operating near the desired force limit, caution should be exercised. Further downward moves should be done in very small steps and/or at very slow speeds. Rapid downward travel into a rigid load may generate forces well in excess of the set limit before the motion can be halted.

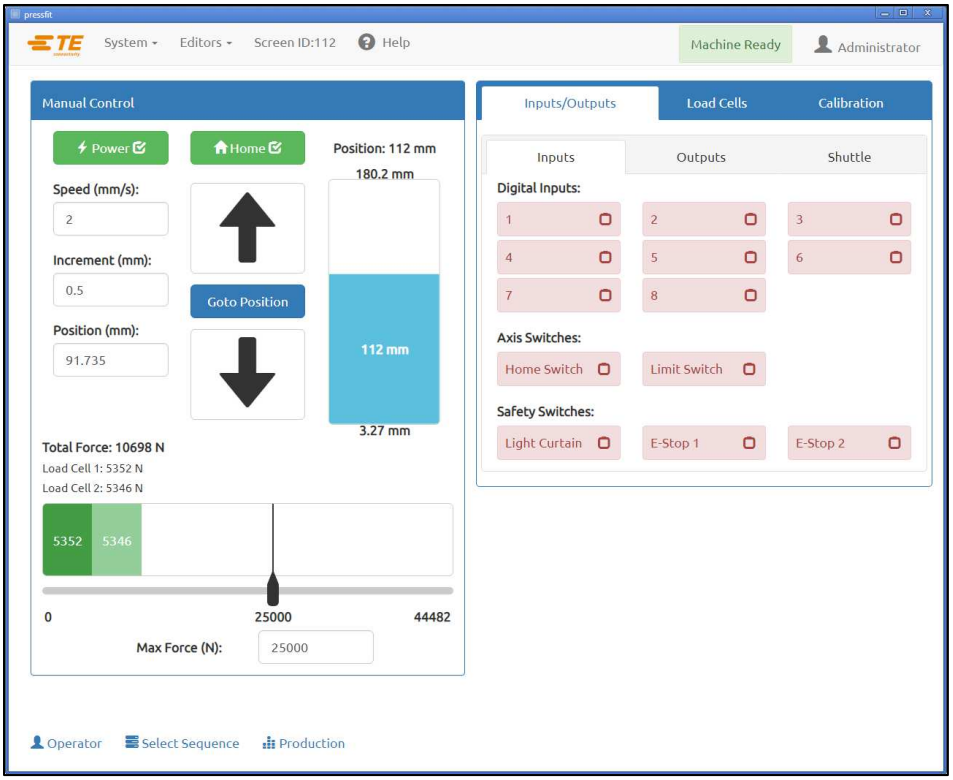

Figure 72

9.2. Inputs/Outputs Tab

The Inputs/Outputs tab is provided for diagnostic purposes and is shown on the right half of the diagnostics screen. The “Inputs” subpanel (see Figure 72) shows the status of all available standard non-safety digital inputs. A green indicator icon with a check mark signals an “on” condition for the given input and a red empty checkbox signals an “off” condition. The statuses of the Home Switch and Limit Switch are also displayed on this panel in a manner identical to the other inputs shown. The “Outputs” subpanel (see Figure 73) shows the status of all standard machine digital outputs. Clicking on an output icon will toggle the corresponding output on/off. A green icon with a checkmark indicates the output is currently in the “on” state, a red empty checkbox indicates the output is currently in the “off” state.

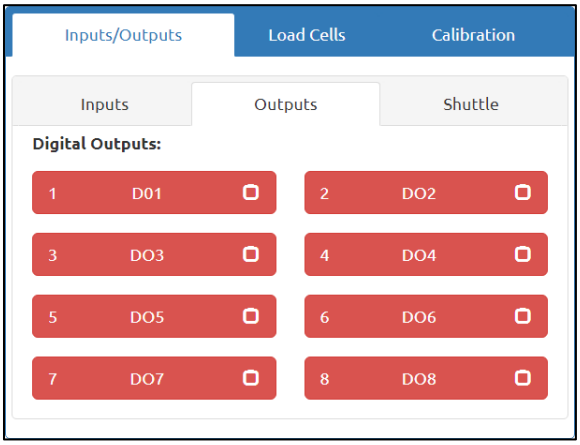

Figure 73

The available shuttle positions are shown on the first row of the “Shuttle” panel (see Figure 74). Selecting a shuttle position will move the shuttle to that position, provided required safety and power conditions are met. The statuses Tool ID Switches are also displayed on this panel in a manner identical to the other inputs shown on the “Inputs” subpanel.

Note: The Shuttle subpanel is only visible on CSP machines.

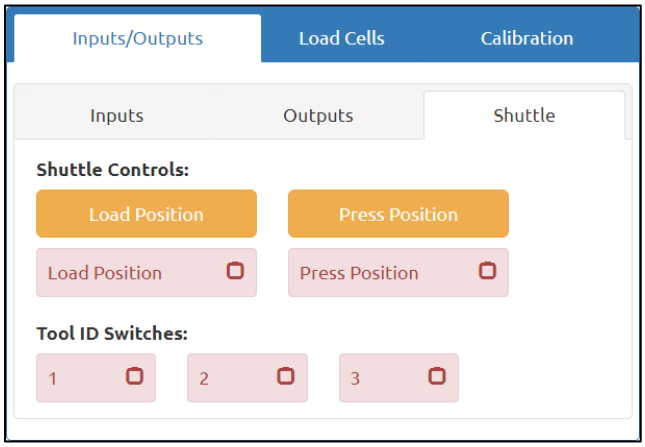

Figure 74

9.3. Load Cells Panel

The "Load Cells" panel (see Figure 75) contains two bar graphs that show the individual force readings for each load cell. This panel also contains the "Tare Load Cells" button which can be used to "zero" the load cells. Press the "Tare Load Cells" button if the machine is reading a force value when no load is present. The "Load Cell Tare Values" are displayed below the "Tare Load Cells" button. These values indicate the current offset from the raw force reading that is used to correctly set the zero point for each load cell.

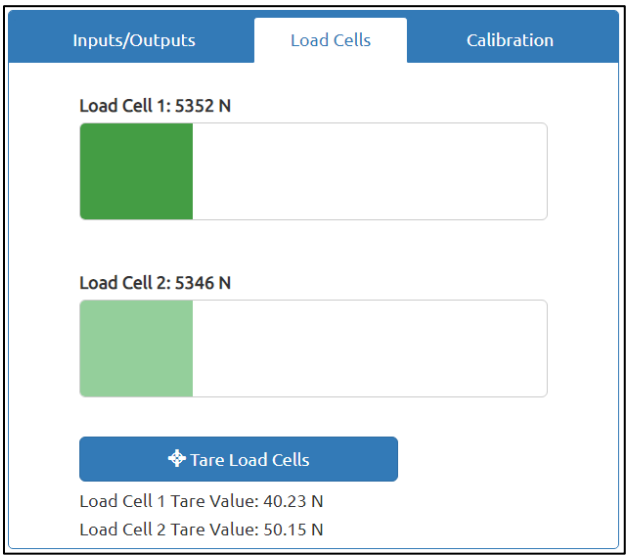

Figure 75

9.4. Calibration Panel

The Calibration panel allows access to the height calibration functions (see Figure 76) and the automatic load cell (force) calibration function (see Figure 77) as well as showing information on the most recent calibration performed (see Figure 79).

NOTE
TE Connectivity also offers a load cell calibration service.

The height calibration functions are located under the “Height” subpanel in the Calibration Panel.

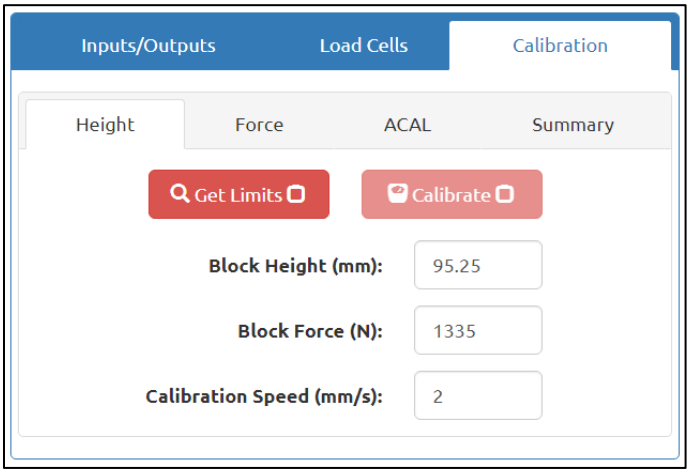

Figure 76

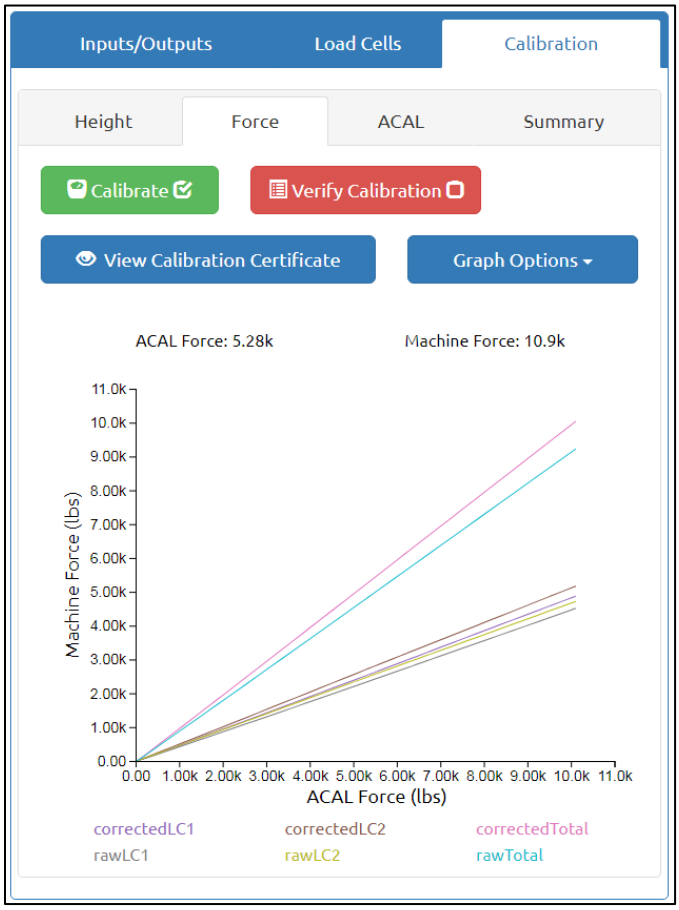
Inputs/Outputs
Load Cells
Calibration
Height
Force
ACAL
Summary
Calibrate
Verify Calibration
View Calibration Certificate
Graph Options
ACAL Force: 5.28k
Machine Force: 10.9k
11.0k
10.0k
9.00k
8.00k
7.00k
6.00k
5.00k
4.00k
3.00k
2.00k
1.00k
0.00
Machine Force (lbs)
0.00 1.00k 2.00k 3.00k 4.00k 5.00k 6.00k 7.00k 8.00k 9.00k 10.0k 11.0k
ACAL Force (lbs)
correctedLC1
correctedLC2
correctedTotal
rawLC1
rawLC2
rawTotal

Figure 77

APPLICATION TOOLING

2901 Fulling Mill Road ♦ Middletown, PA 17057
Phone: (800) 722-1111 ♦ FAX: (717) 810-2861 ♦ www.tooling.te.com

Certificate of Calibration

Number: S0511788152020710954

Calibration Standard

Instrument
Model: SSI — S/N: 399249 — Calibration Due: 02/25/2021
ID: N/A — Manufacturer: Transducer Techniques

Load Cell
Model: SWP-10K — S/N: 365724 — Calibration Due: 01/01/2021
Accuracy: 1% FS (10000lbs)

Calibration Conditions

Technician: IB — Date: 7/10/2020, 9:54:02 AM — Software Version: 1.1.10
Temperature: 20C — Humidity: 25%
Type: Map — Sample Count: 67

Location of Calibration: Middletown, USA — Signature:_____

Machine Data

Model: CSP — S/N: 1178815
Max Force: 10000 lbs — Accuracy: 0.25% FS (10000 lbs) — Calibration Frequency: 12 Months

Calibration Results

Max % F.S. Error: 0.097% @ 1159 lbs

Found lbs						Left lbs					
Standard	Measured	OK	Min	Max	Rel. % Err.	Standard	Measured	OK	Min	Max	Rel. % Err.
52.0	52.8	√	-48.0	152.0	1.5	145.0	140.6	√	120.0	170.0	3.00
377.0	379.3	√	277.0	477.0	0.6	322.0	315.5	√	297.0	347.0	2.03
807.0	809.6	√	707.0	907.0	0.3	512.0	502.9	√	487.0	537.0	1.78
1,638.0	1,640.0	√	1,538.0	1,738.0	0.1	710.0	702.8	√	685.0	735.0	1.01
2,881.0	2,884.3	√	2,781.0	2,981.0	0.1	927.0	919.8	√	902.0	952.0	0.78
4,106.0	4,110.7	√	4,006.0	4,206.0	0.1	1,159.0	1,149.3	√	1,134.0	1,184.0	0.84
5,302.0	5,310.3	√	5,202.0	5,402.0	0.2	1,790.0	1,780.7	√	1,765.0	1,815.0	0.52
6,479.0	6,488.6	√	6,379.0	6,579.0	0.1	2,455.0	2,448.2	√	2,430.0	2,480.0	0.28
7,669.0	7,677.0	√	7,569.0	7,769.0	0.1	3,151.0	3,148.2	√	3,126.0	3,176.0	0.09
9,791.0	9,803.9	√	9,691.0	9,891.0	0.1	9,642.0	9,646.9	√	9,617.0	9,667.0	0.05

As Found Condition: In Tolerance
As Left Condition: In Tolerance

The instrument on this certification has been calibrated against standards traceable to the National Institute of Standards and Technology (NIST) or other recognized national metrology institutes, derived from ratio type measurements, or compared to nationally or internationally recognized consensus standards.

A test uncertainty ratio (T.U.R.) of 4:1 [K=2, approx. 95% Confidence Level] was maintained unless otherwise stated.

When uncertainty measurement calculations have been calculated per customer request, reported condition statements do not take into account uncertainty of measurement. All results contained within this certification relate only to item(s) calibrated. Any number of factors may cause the calibration item to drift out of calibration before the instrument's calibration interval has expired.

Figure 78

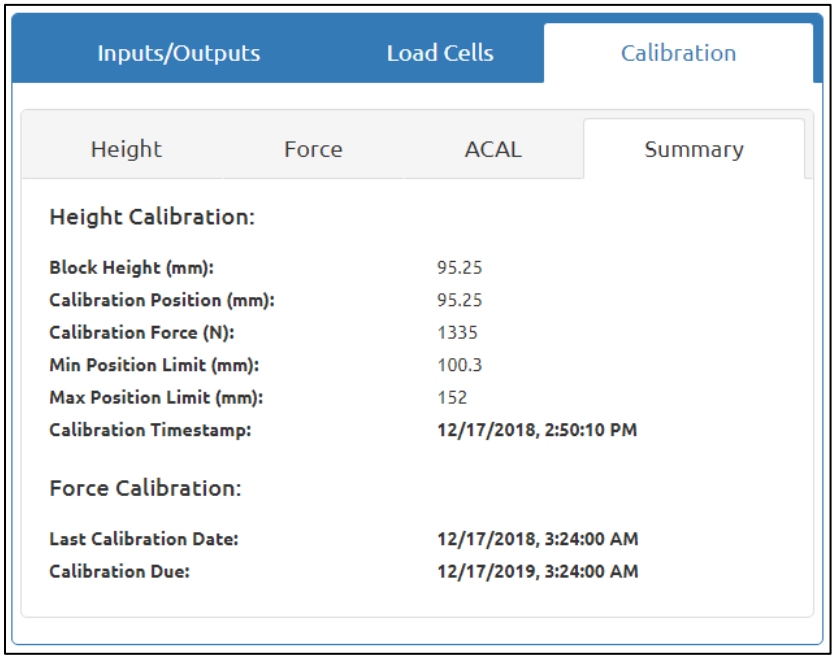

Figure 79

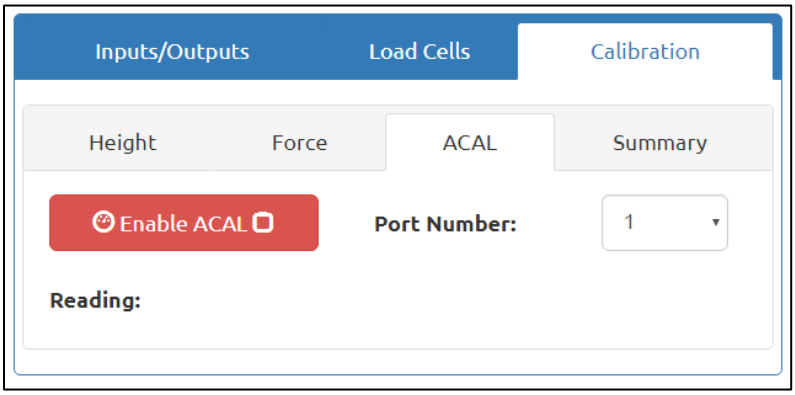

Figure 80

The “Get Limits” button initiates a sequence to find the limit switch positions and set the upper and lower motion limits to an appropriate distance from the switch positions. The “Calibrate Height” button will run a motion sequence which will exert the amount of force specified in the “Block Force” entry field on a height spacer block to calibrate the axis position relative to the surface of the machine table. Prior to calibration the height of the spacer block must be entered into the “Block Height” entry field and the force to calibrate the height at must be entered into the “Block Force” entry field. The speed at which the axis should move down to perform calibration must be entered in the “Calibration Speed” field.

The Z axis zero is defined as the position where the head pressing surface is in contact with the table and loaded to the force specified in the “Block Force” entry field. The load is applied to be sure all clearance is eliminated from the various head components such as the ball screw and the head to structure air gap.

Since the head cannot actually travel all the way to this point, a spacer block must be placed between the head and the table to set the zero position. A tool is supplied with the press for this purpose. This same tool is also used for PCB thickness measurement. The height of this tool should be entered in the “Block Height” entry field prior to height calibration.

To set or verify the Z axis zero position, place the spacer block on the table, centered beneath the head anvil. The head should be positioned at the center of the machine. It is recommended that the “Calibration Speed” field be set to less than 1 mm/s. At this point, press “Calibrate Height”.

WARNING
Due to the machine’s high rigidity, the force can build very quickly, resulting in significant force overshoot if the Z axis is moving faster than the minimum speed. Always reduce the speed when approaching an object such as the thickness probe tool. Use incremental mode @ 0.10 mm or 0.02 mm when manually pressing in the joystick.

The force calibration functions are located under the “Force” subpanel in the Calibration Panel. To perform force calibration, you must be logged in as TE Administrator. Prior to force calibration, the ACAL unit must be connected to the USB-RT connection on the machine and the digital readout must be connected to ACAL load cell and powered on. Position the ACAL unit under the anvil and center with centering tool part number 2216917-1 (see Figure 81).

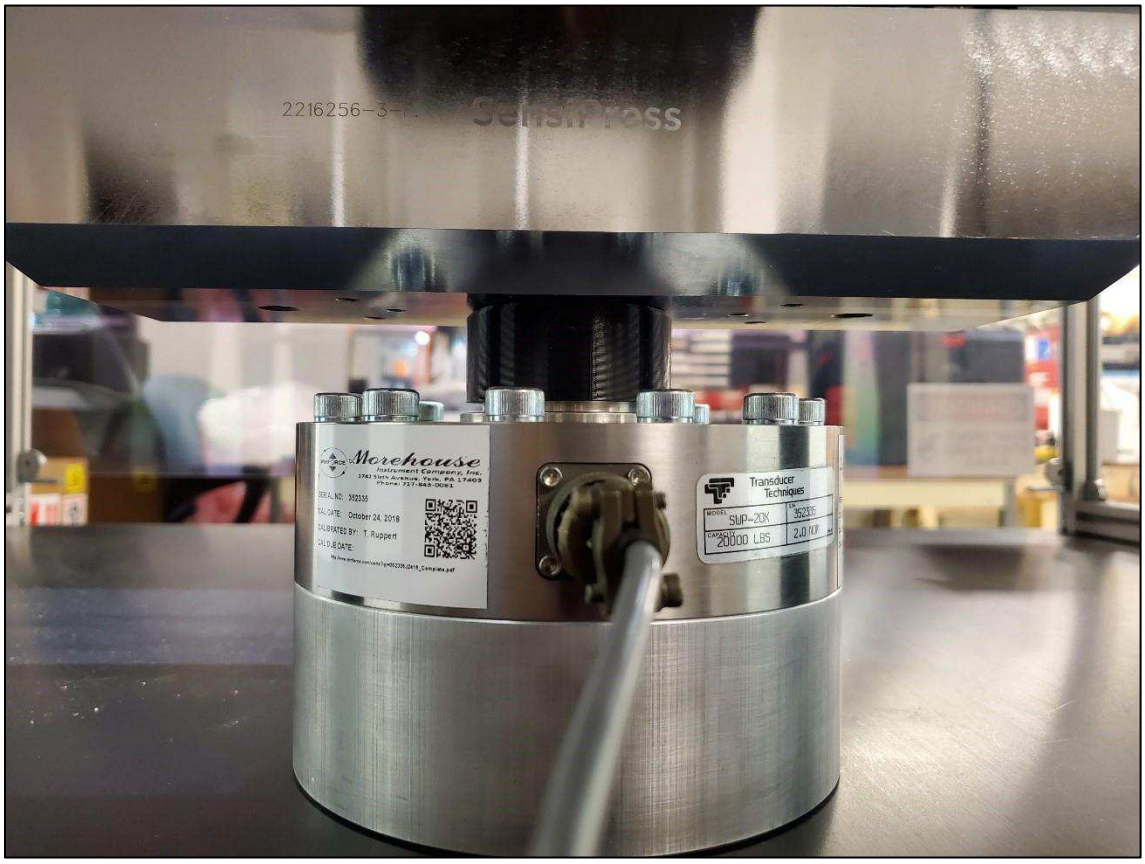

Figure 81

Remove centering tool and then manually lower anvil to just above load cell. The “Calibrate” button will open the calibration certificate form window. The user must fill out all fields in this form prior to calibration (see Figure 82 thru Figure 85). Press the “Begin Calibration” button to start the force calibration motion sequence. When calibration is complete, the calibration certificate will be opened, and the calibration graph will be populated with the force position date from calibration. To reopen the calibration certificate, press the “View Calibration Certificate” button (see Figure 77 and Figure 78).

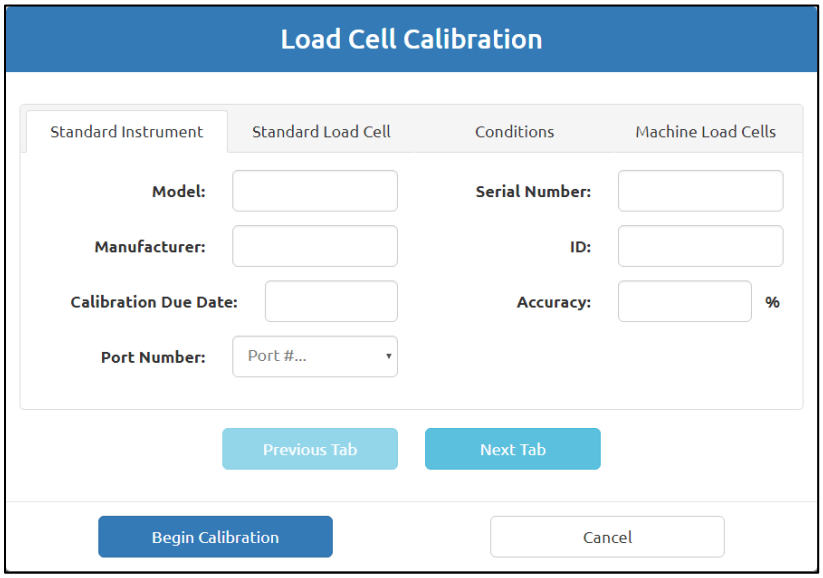

Figure 82

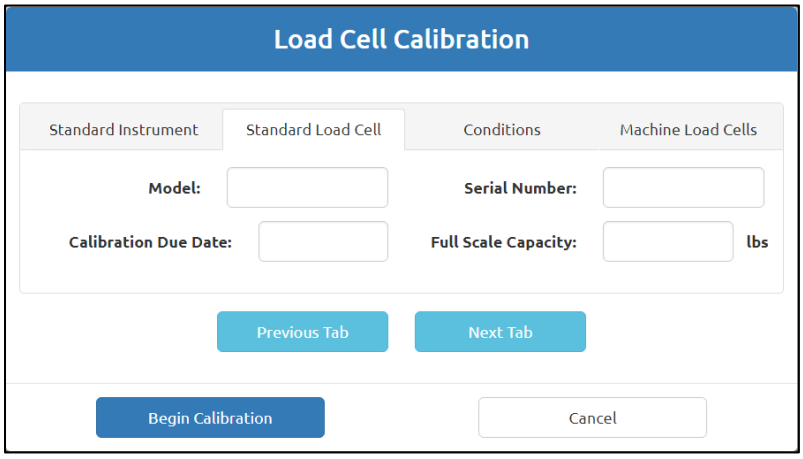

Figure 83

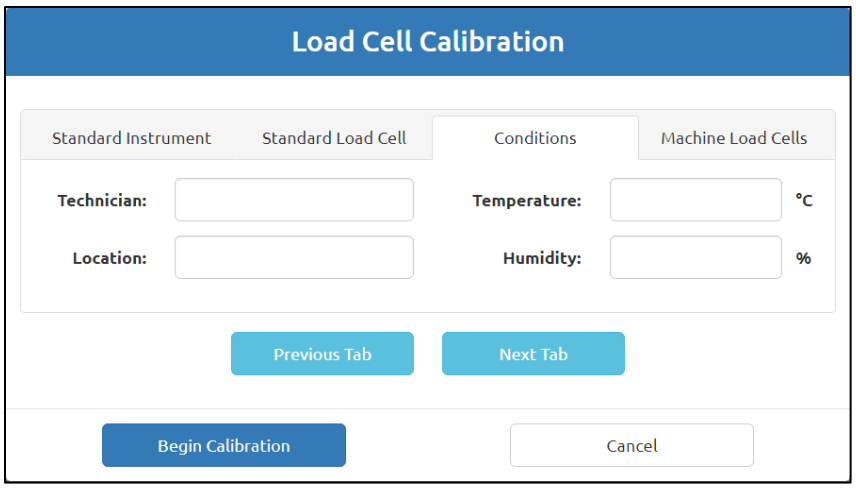

Figure 84

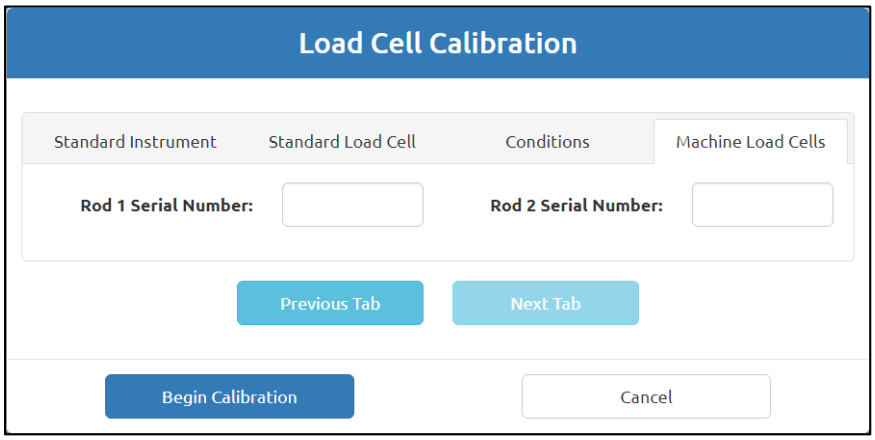

Figure 85

10. DATA UTILITIES

10.1. **Message Viewer**

The “Message Viewer” screen (Figure 86) is located under the System drop-down menu. The message viewer allows the user to view the history of the last 1000 messages sent between the Human-Machine Interface (HMI) and middleware portion of the software. Most users will not need to use this screen regularly. This screen is primarily used by TE personnel for troubleshooting purposes. The messages on this screen provide an in-depth history of machine operations. The bottom portion of the screen shows the message history. The “Suppress Ping/Pong” checkbox can be used to filter out ping/pong messages that are only used to verify the connection between HMI and middleware still exists. The “Suppress RX” checkbox can be selected to filter out messages received by the HMI, and the “Suppress TX” checkbox can be selected to filter out messages transmitted from the HMI to the middleware.

The pause button (“Pause” icon) can be pressed to pause the stream of messages being added to the message history. Pressing the pause button will also enable buttons to reverse the sort order of the messages, jump to the last message, and jump to the first message. Press the play button (“Play” icon) to resume adding messages to the message history.

The text box at the top of the “Message Viewer” screen can be used to send custom messages to the middleware from the HMI for diagnostic purposes. This can be used to replay a series of actions carried out by the user. Use the “Send Message” button to send the message to the middleware after entering a valid message into the text box. The "Export Message History" button will export the last 1000 messages of the message history as a text file to a USB drive plugged into the HMI computer USB port on the side of the machine.

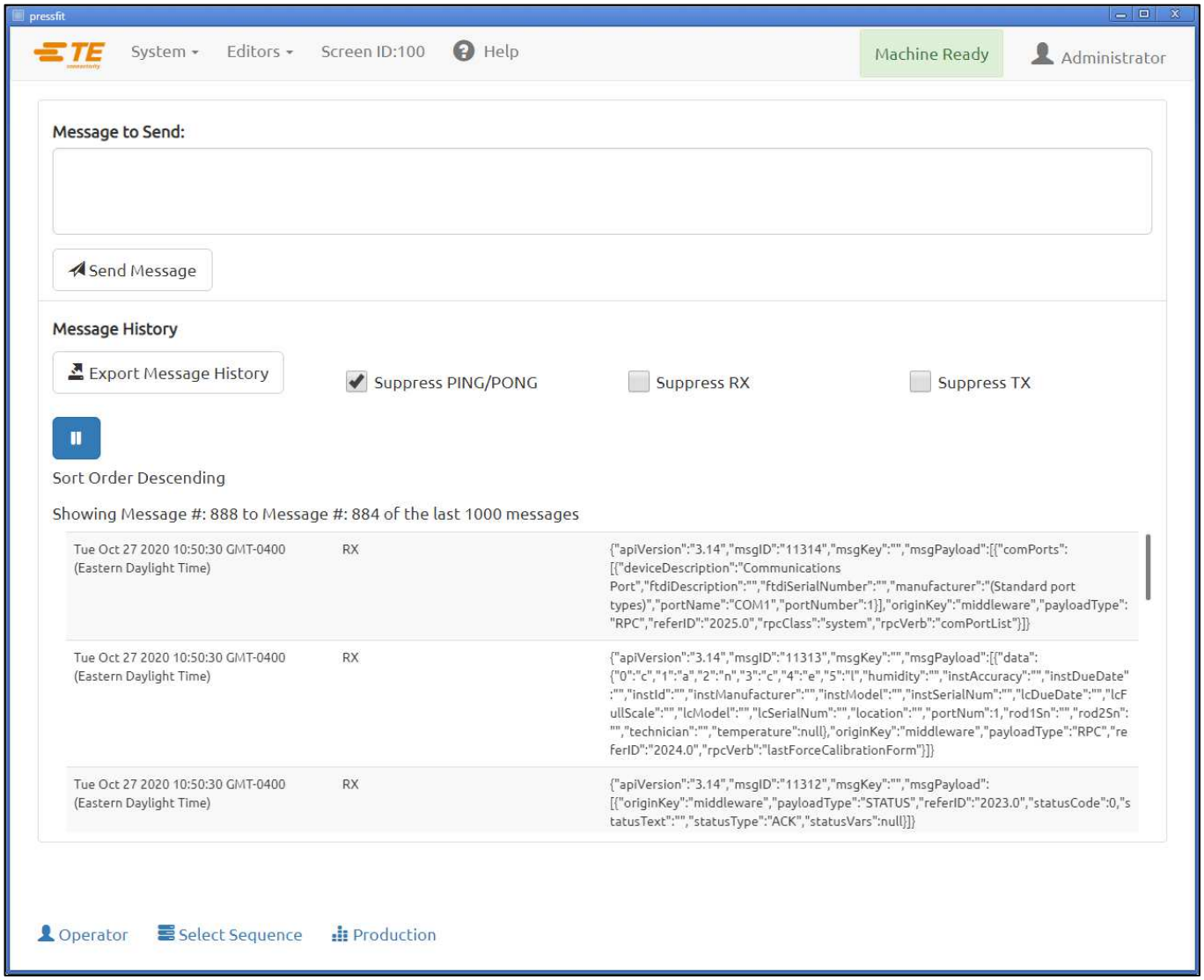

Figure 86

10.2. **Machine Logs**

The “Log Viewer” screen (see Figure 87) is located under the System drop-down menu. The “Log Viewer” screen allows viewing of the various log files related to machine operation. The “Search” text entry field can be used to search the list of “Log Files” by name. An entire log file can be viewed, or only a portion of the log can be loaded. To load an entire log file, select the desired log file from the list of files, leave the “Begin” and “End” entry fields blank, and press “Get Log”. To get a portion of a log file, enter the numerical character index at which to begin viewing the file into the “Begin” entry field and the index of the end character into the “End” field. For example, entering a beginning of “500” and an ending of “750” will display characters 501 to 750 from the log file (character indexes 500 to 749).

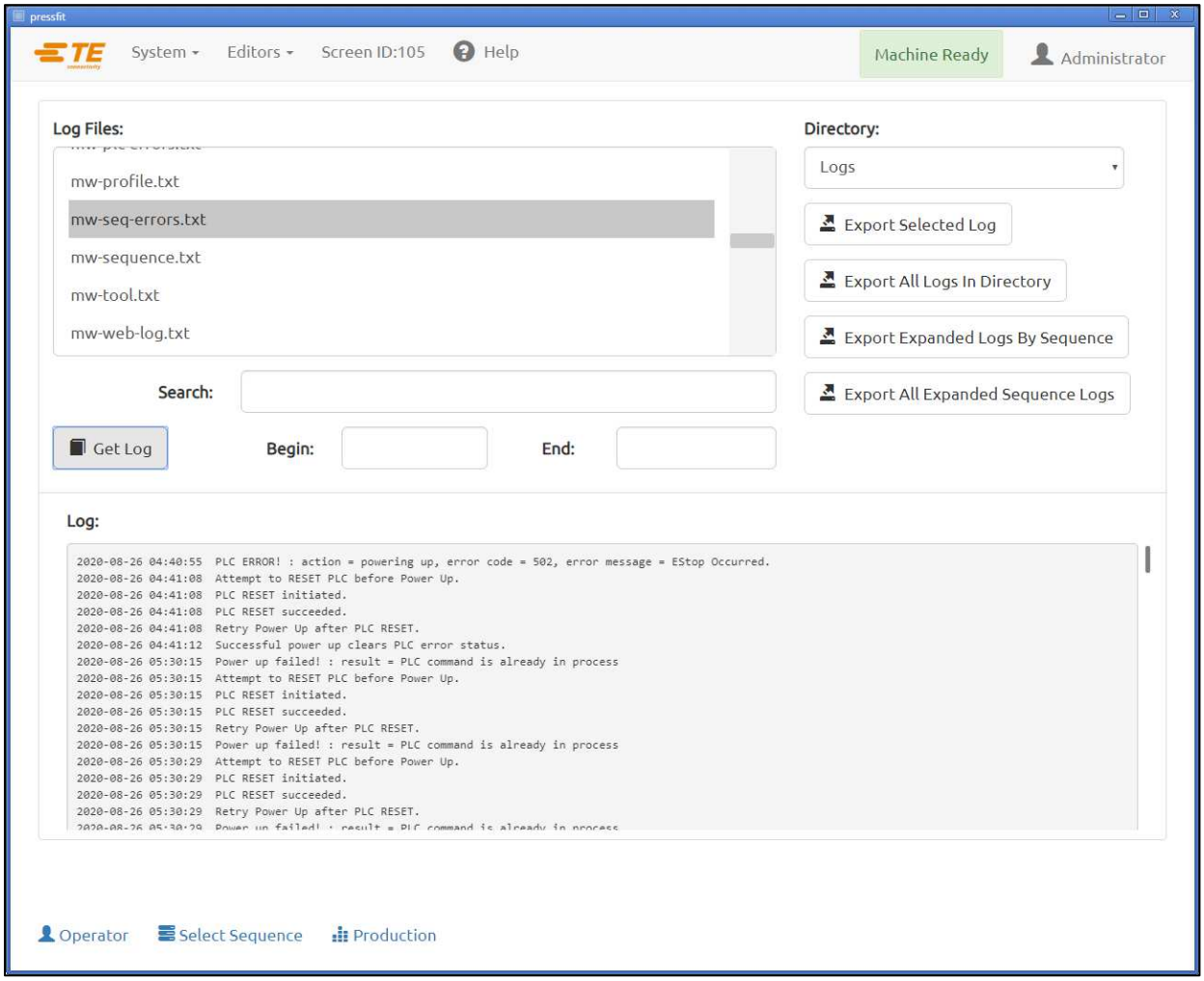

Figure 87

The “Directory” dropdown selects which directory log files are retrieved from. The “Logs” directory contains the standard press and machine log files. The “MachineData” directory contains the calibration log files. Press the “Export Selected Log” button to save the selected log file to an external storage device. Press the “Export All Logs In Directory” button to save all the log files in the selected directory to an external storage device. An expanded version of the sequence logs can be created and exported using the "Export Expanded Logs By Sequence" and "Export All Expanded Sequence Logs" buttons. The expanded sequence log has the press log data from all corresponding connector presses in the sequence appended to the end of the sequence log. Expanded logs for all available sequence logs can be exported using the "Export All Expanded Sequence Logs" button. To export expanded logs for only one particular sequence, press the "Export Expanded Logs By Sequence" button and enter the sequence name in the text entry box that is displayed.

The error log is automatically appended with every error message that is displayed during any machine function. This includes time and date stamp, and description. By reviewing the logs, machine operation can be evaluated on a detailed level.

11. SETUP UTILITIES

11.1. System Settings

The “System Settings” screen is accessed via the System drop-down menu and is used for setting the machine configuration and other miscellaneous parameters as described below.

A. Localization Settings

- **Distance Units** – set the HMI to display distance as either millimeters or inches.
- **Force Units** – set the HMI to display force as either Newtons or pounds force.
- **Temperature Units** – set the HMI to display temperature as either degrees Fahrenheit or degrees Celsius.
- **Decimal Format** – set how the HMI displays the decimal separator, as period “.” Or comma “,”.
- **Language** – set the language that the HMI displays text in.
- **Keyboard Layout** – set the layout for the on-screen keyboard.
- **Date and Time Settings** – set the system date and time for the machine, as well as the format for displaying dates.
- **Locale -** set the format for how dates are displayed on the HMI.
- **Time Zone -** set the time zone to use for the HMI system date and time.
- **Use Time Server -** check this option to enter a network time server to use for the HMI system date and time.

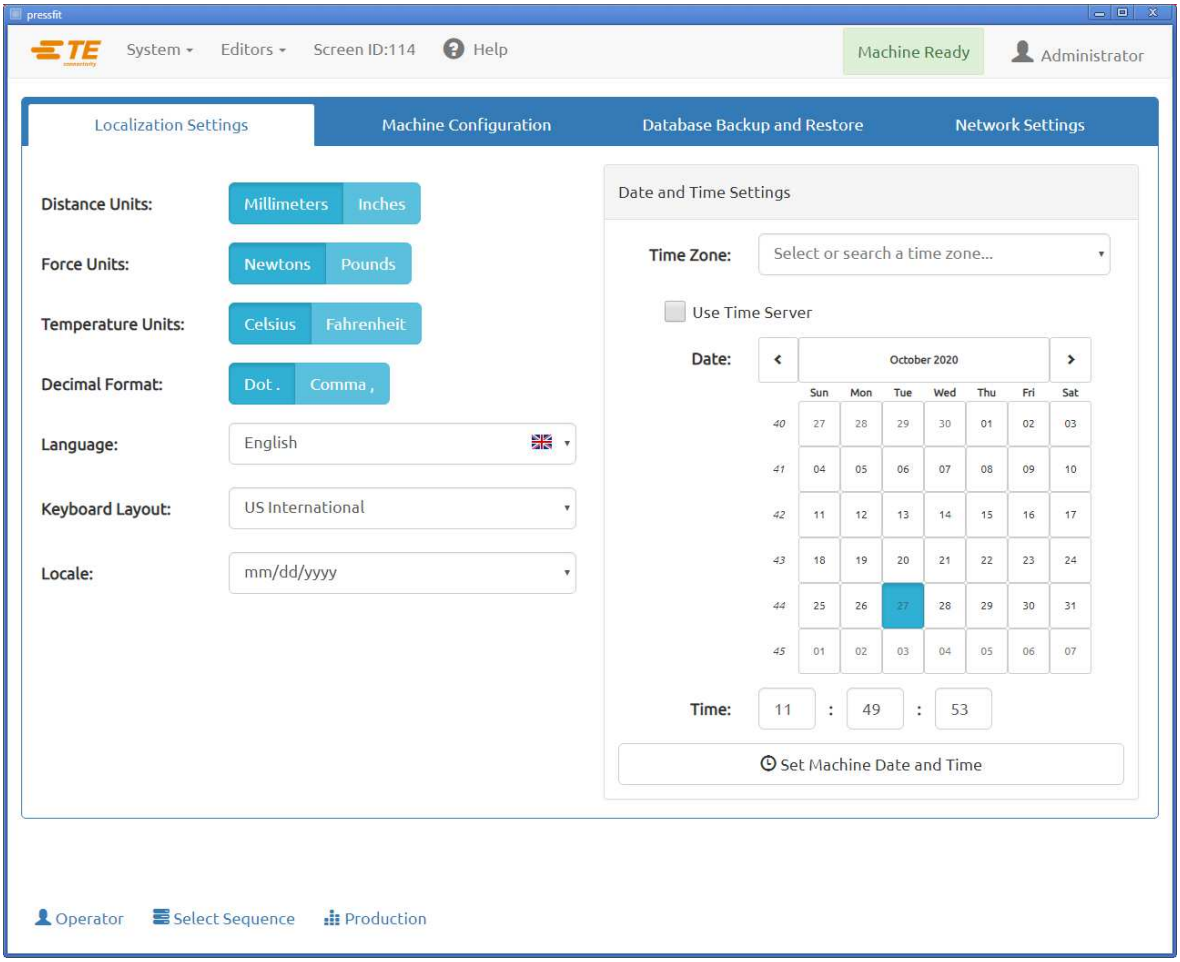

Figure 88

B. Machine Configuration

The Machine Configuration tab (see Figure 89) contains various parameters used to define certain aspects of machine motion and has options to enable or disable certain machine functionality. After updating the machine configuration, the “Save Machine Configuration” button must be pressed to save the current configuration to machine database. Most machine configuration options can only be modified by TE personnel. A couple of machine configuration options can be modified by the user (non-TE personnel). The "MES Enabled" machine configuration option is used to configure the MES connection settings for connecting to an MQTT server. After the configuration has been saved, these settings can be tested using the "Connect To MQTT Server" and "Disconnect MQTT" buttons. The "Spacebar Action Enabled" machine configuration option allows the spacebar on the hardware keyboard to trigger the "Action Button" on the "Production" screen. This feature allows the user to initiate a connector press using the hardware keyboard instead of the touchscreen. The “Refresh COM Ports” button can be used to update the list of currently available COM ports if a new device has been to the machine. The user defined Input and Output maps can also be defined using the “Input Map” and “Output Map” tabs. Enter descriptive text for the appropriate input or output channel and click “Save Machine Configuration” to store the map to the machine database. Mapped input or output names will be shown when those inputs or outputs are displayed on the “Machine Diagnostics” screen. The "Machine State Map" tab can be used to assign a digital output to turn on, turn off, or blink based on the current machine state. This can be used when connecting a light tower to a machine. If the user has purchased an ACAL license, the "Import ACAL License" button is used to add the purchased license to the machine and unlock the force calibration function for users other than "TE Administrator".

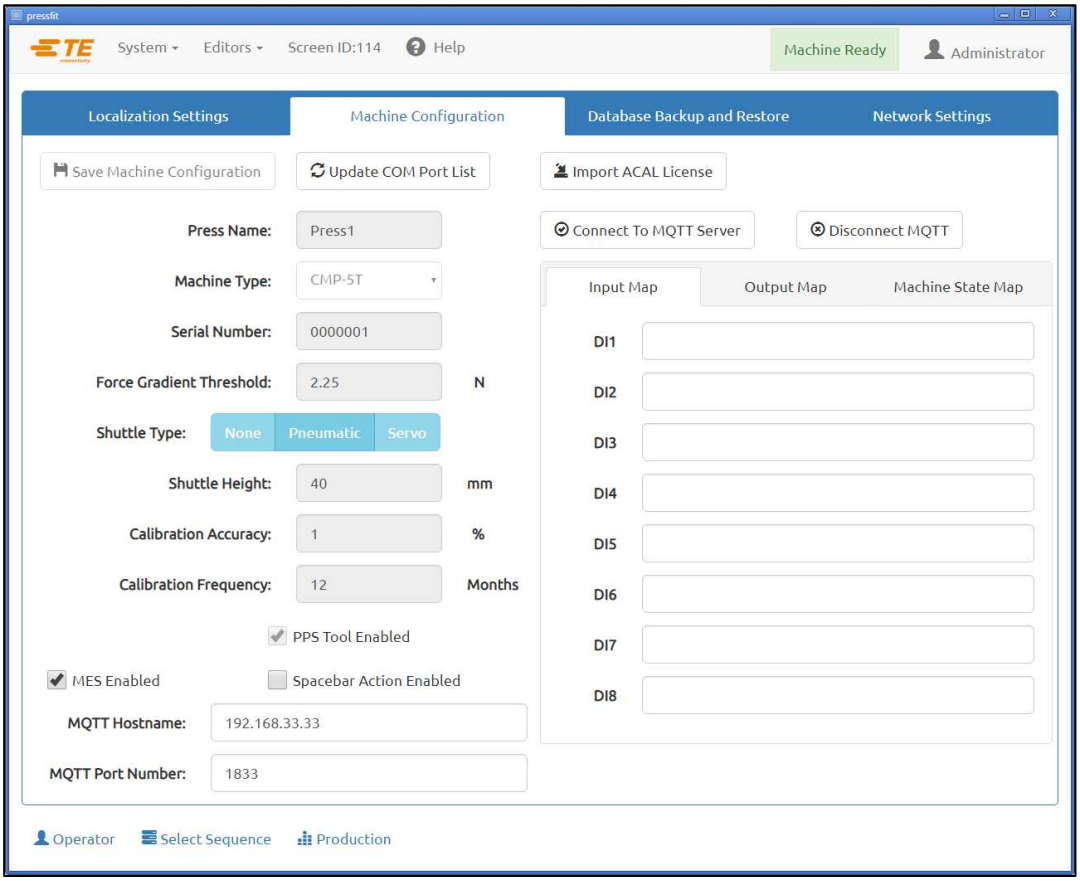

Figure 89

C. Database Backup and Restore

The Database Backup and Restore tab (see Figure 90) contains buttons to manage the user and machine databases. To backup the user database use the backup user database file browser to select a file location to save the database backup to, and press the “Backup User Database” button. To restore the user database from a previous backup, use the restore user database file browser to select the database to restore from and press the “Restore User Database” button. To reset the user database to factory settings, press the “Restore User Database to Factory State” button. The user database contains all part (tools, profiles, connectors, conditions, and sequences) and user data. The machine database contains information relevant to the machine’s configuration and can only be reset, backed up, or restored by TE personnel.

The "Update Machine Software" button is used to install a machine software update. To install a software update, copy the update file (in the format "PressFitMachineUpdate-yyyy-mmdd.zip") to the root folder of a USB drive. Do not unzip the update file. Plug the USB drive into the HMI USB port on the side of the machine. Press the "Update Machine Software" button and select the update .zip file using the file browser. The machine will install the update automatically, and reboot each software component. The update process will take approximately five minutes to complete.

The "Compress and Transfer Log and Machine Data Files" button will export a .zip file containing all the Log and Machine Data files on the machine to a USB drive. This process can take up to one hour to complete.

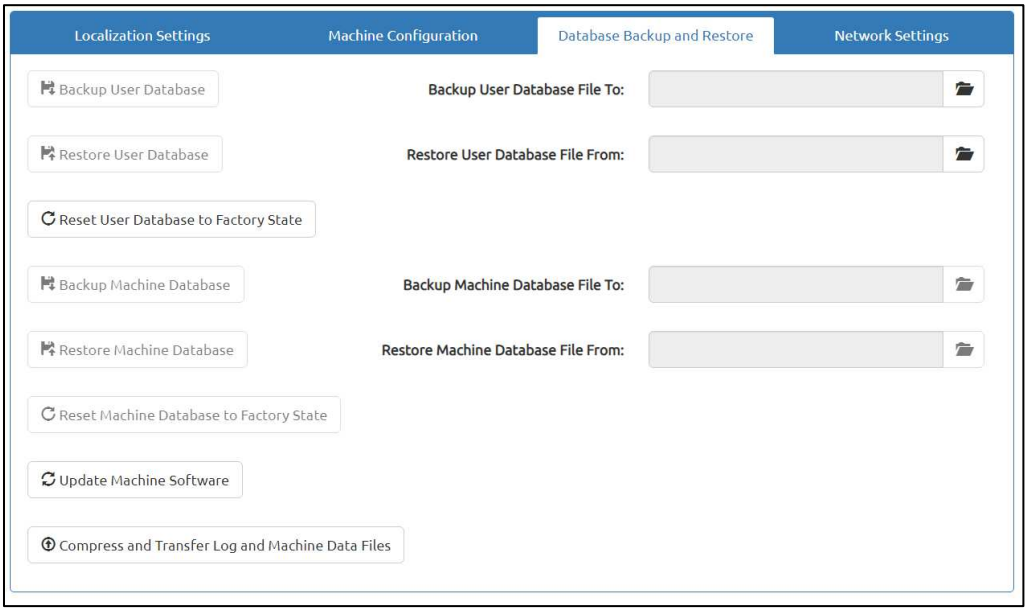

Figure 90

D. Network Settings

The Network Settings tab contains configuration settings for the network interfaces on the HMI PC. These settings allow the machine to be configured to connect to an external network or MES Server. The HMI PC has two network interfaces. One of these interfaces is used to communicate with the machine's Beckhoff PLC and should not be modified. This interface is typically configured with an IP address of "192.168.0.1". The other network interface has a connection point on the side of the machine, and can be used to connect to an MES system or other external network. The "Set Network Configuration" button will save the current network settings to the machine's HMI PC.

11.2. **User Access**

User access to the various machine functions is controlled by password protected individual user accounts. To create a new user, an individual with Administrator Access permission must log in and use the “Add Operator” button on the “Operator” screen. A new user’s access will be limited base the “Operator Type” selected when creating a new user. When modifying an existing user’s account, only administrators may modify user account permissions. However, an administrator is not able to modify his or her own access permissions, only another administrator may do that. All users can change their own user passwords.

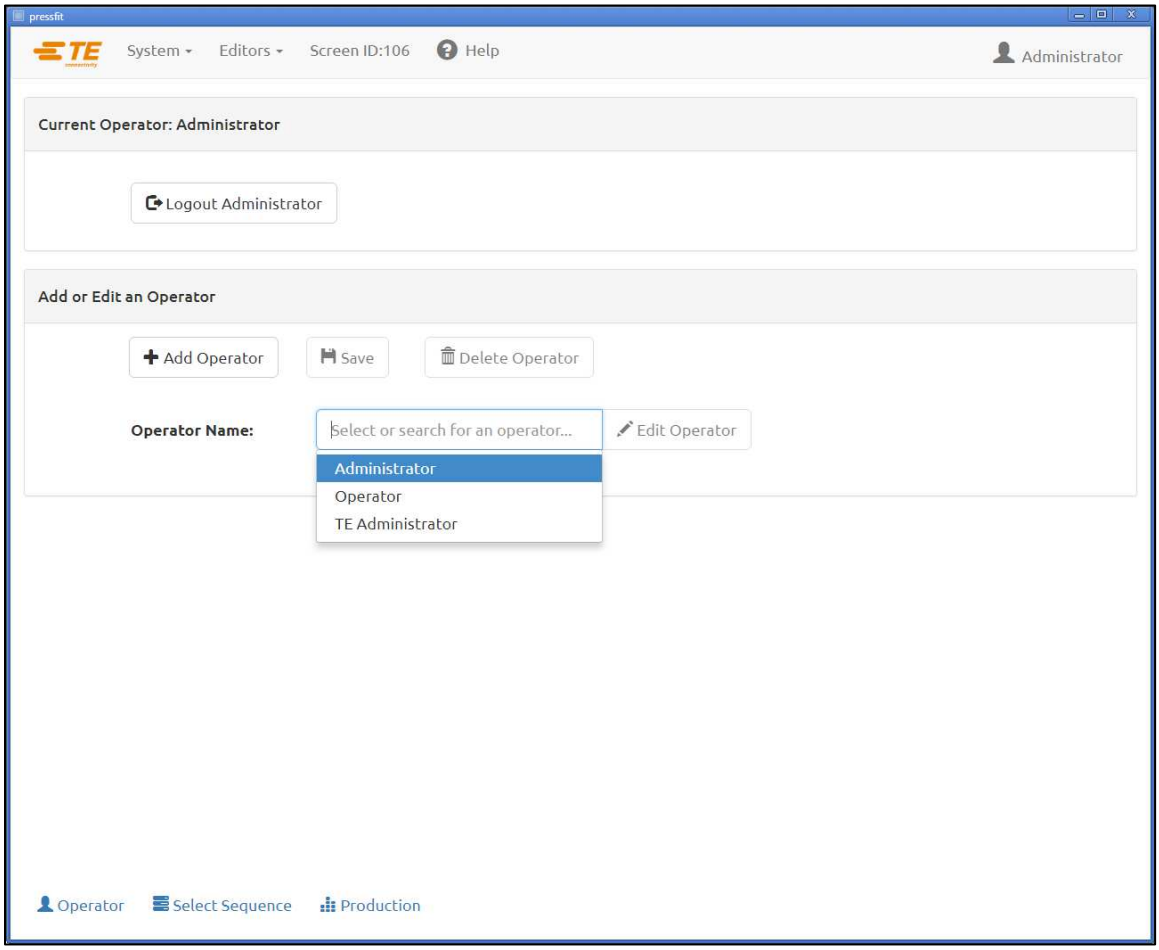

Figure 91

Fill in the operator name, the password, and select the operator type from the drop-down menu, which defines which screens and features the user will able to access. The available operator types or access levels are (in hierarchical order) “Administrator”, “Maintenance”, “Technician”, “Inspector”, “Operator” and “Restricted Operator” (see Figure 92).

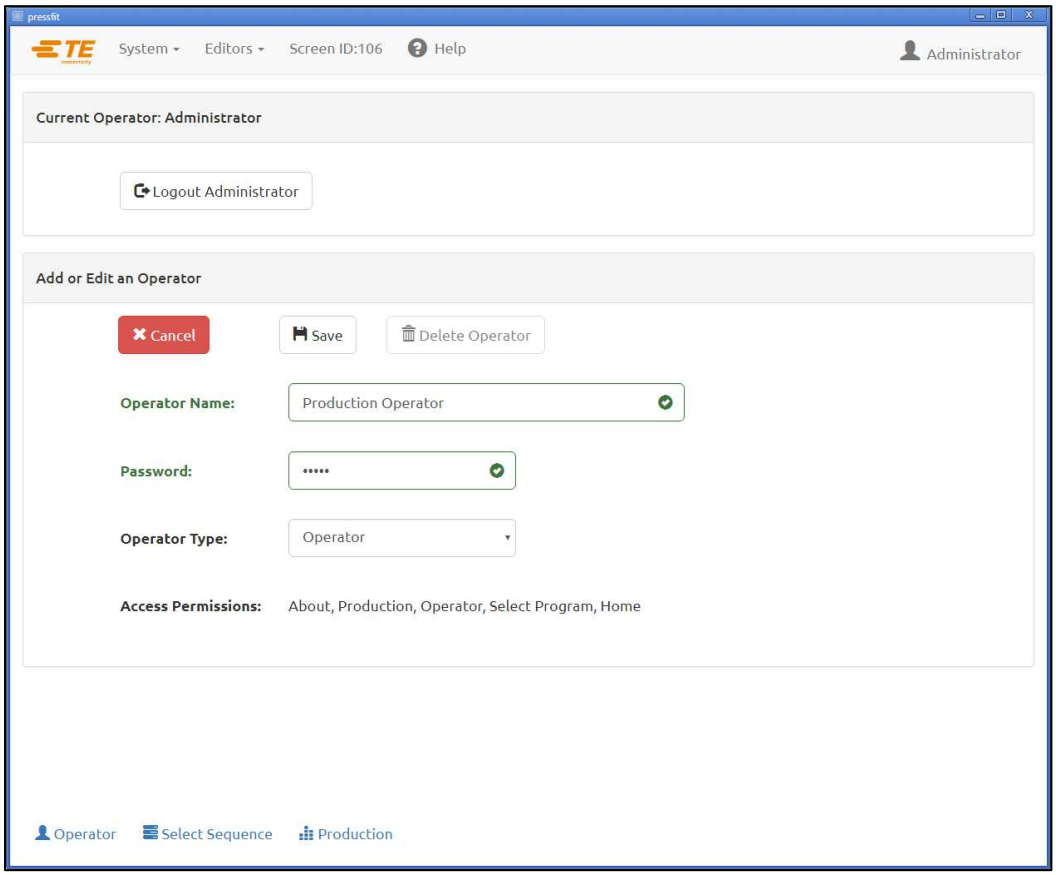

Figure 92

11.3. **Network Viewer**

The Network Viewer screen (see Figure 93) displays information about the connection from the HMI (Human Machine Interface) computer to the rest of the machine software. Information about any MES machine connections can also be viewed here.

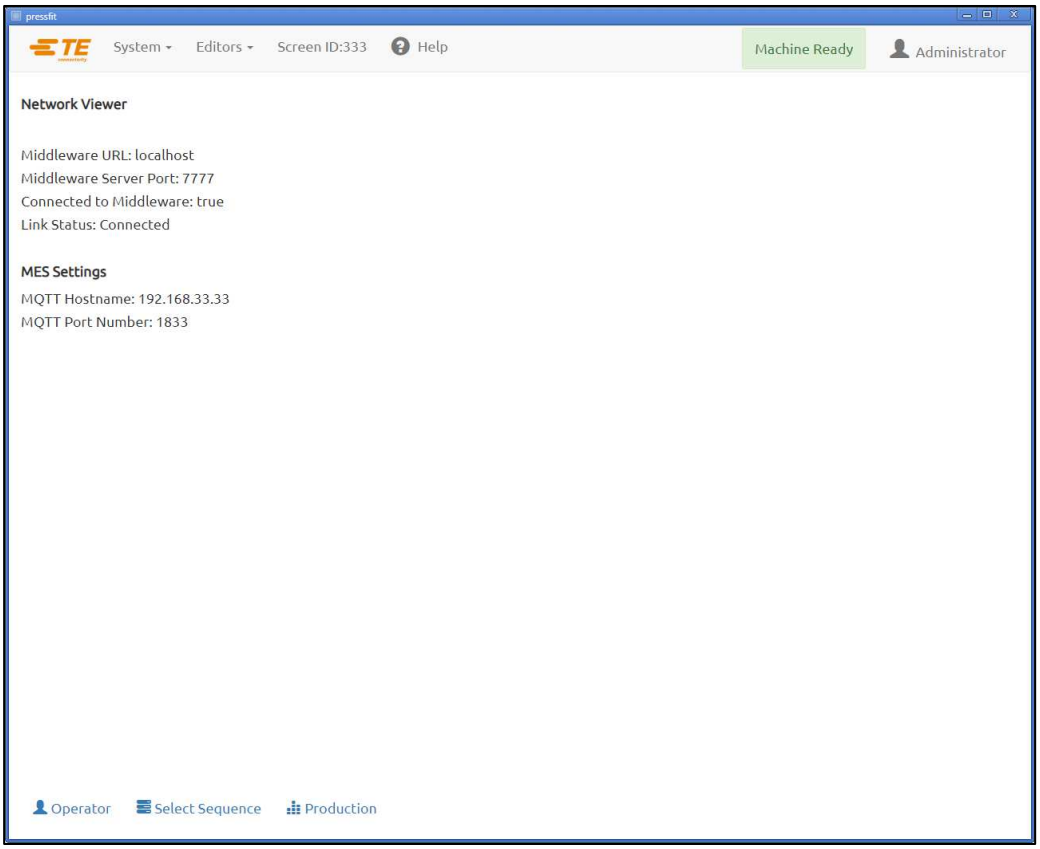

Figure 93

11.4. **Beckhoff Configuration**

The Beckhoff Configuration screen displays information about the Beckhoff PLC controller used in the machine. This screen is primarily for use by TE personnel for troubleshooting purposes.

11.5. **Beckhoff Remote Desktop**

The Beckhoff Remote Desktop screen is used to launch the remote desktop utility that allows access to the Beckhoff PLC computer. This screen is only used for access the barcode scanner utility software and other third party device software for setup and maintenance purposes. Click the “Launch Remote Desktop” button (Figure 94) to launch the remote desktop viewer and access the Beckhoff PLC computer.

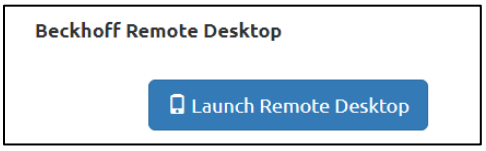

Figure 94

11.6. **PPS Viewer**

The PPS Viewer screen provides access to all available PPS tool commands for setup and troubleshooting. The PPS Viewer screen will only be available if PPS is enabled for the machine. The “Basic Commands” tab (see Figure 95) provides access to the most commonly used PPS commands. These commands are used to view pin states and setup the pin mask(s) for the tool.

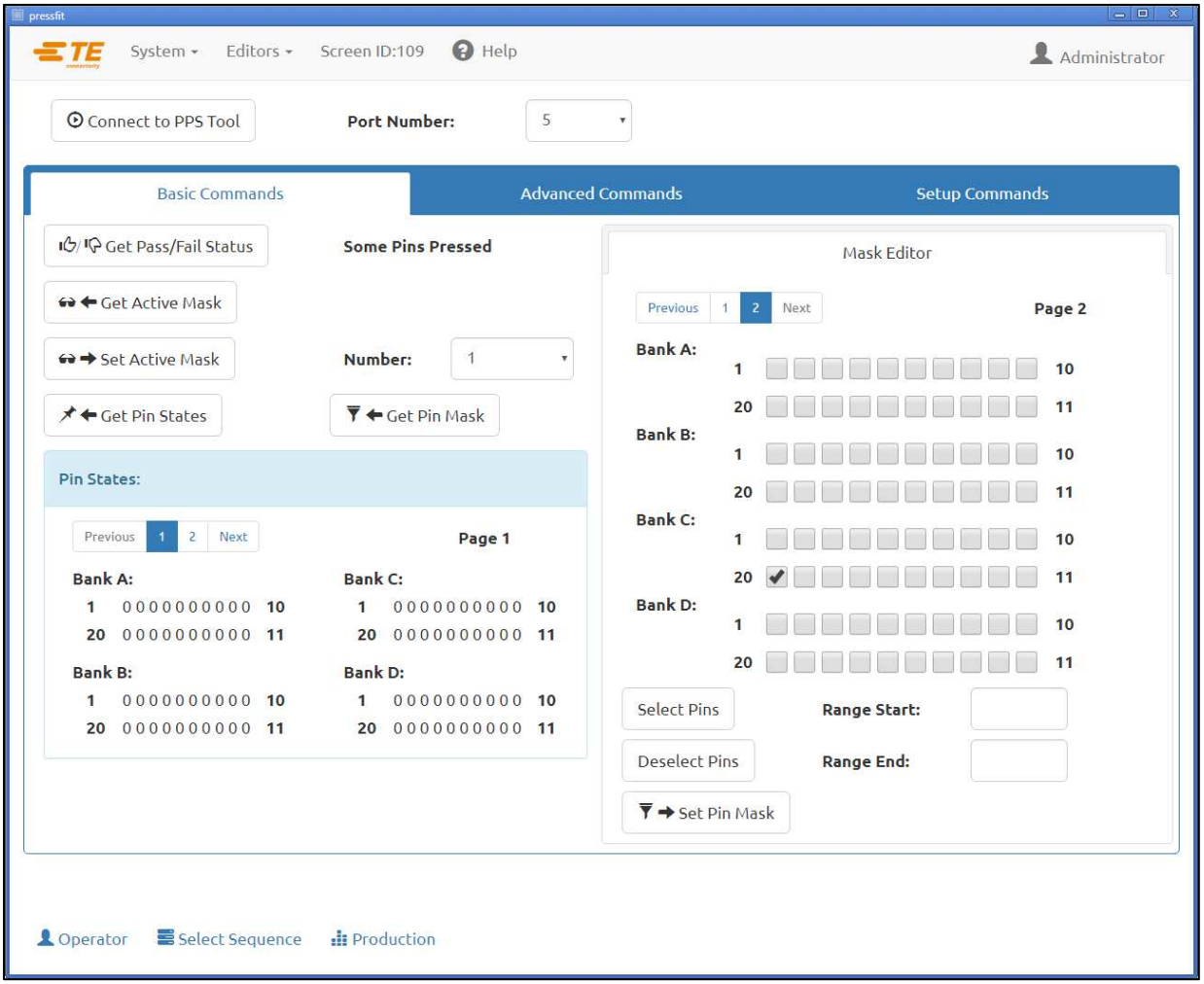

Figure 95

The “Advanced Commands” (see Figure 96) provides access to commands to view information about the PPS tool and about the tool setup.

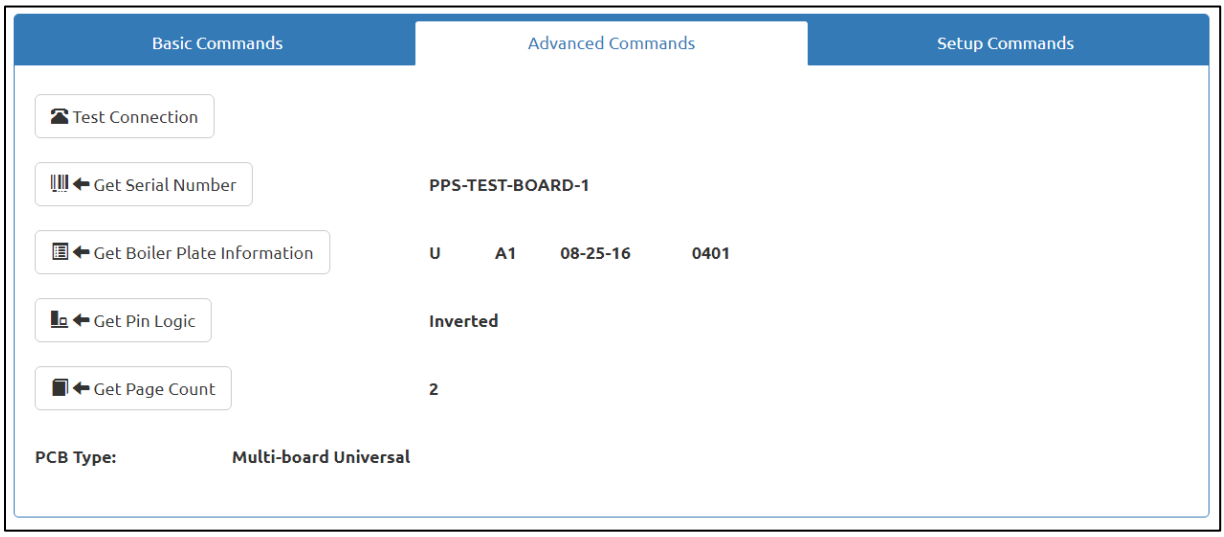

Figure 96

The “Setup Commands” tab (see Figure 97) provides access to commands for setting up PPS tool or PPS tool circuit board. Most commands on this tab are only accessible by TE personnel.

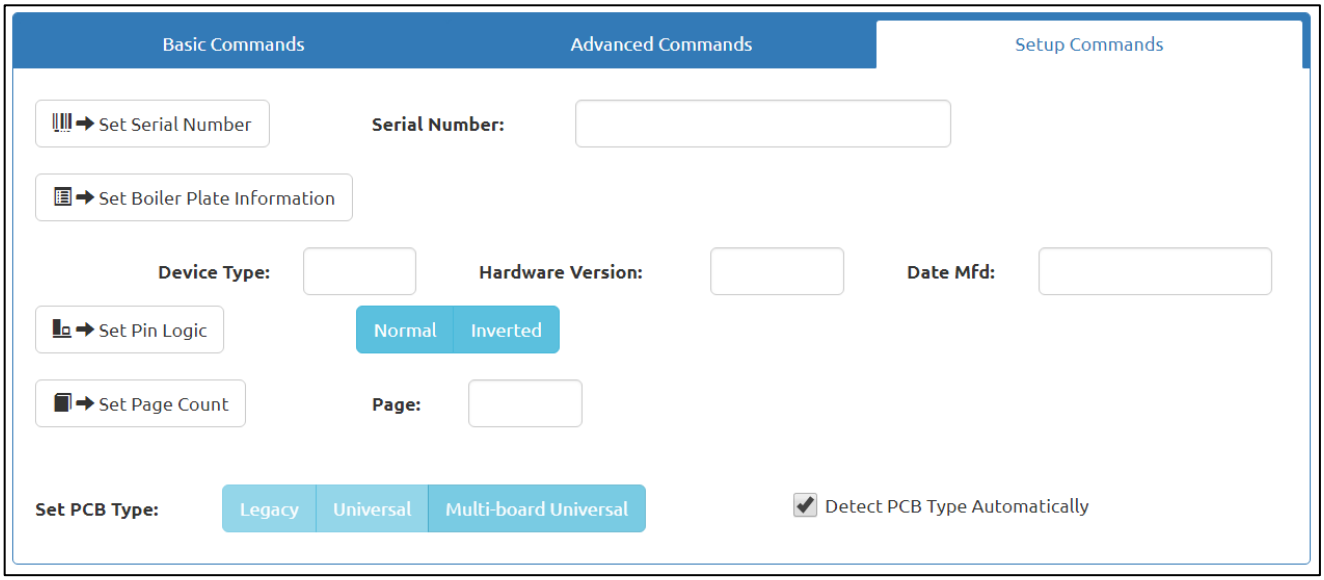

Figure 97

12. PREVENTIVE MAINTENANCE

The press has been designed to minimize maintenance as much as possible. The following preventive maintenance procedures should be done on the intervals given below. An annual inspection, adjustment, and calibration service is offered by TE.

DANGER
Always turn off the main power switch and disconnect the electrical cord from the power source when performing maintenance on the press.

12.1. Accessing the Press Head (CBP)

To gain access to the CBP press head for inspection or service, open the front or rear door in the top hood.

Actuate the latch to open the hood, front or rear. To gain access to the CMP press head, remove the front cover panel.

12.2. Cleaning

All surfaces should be kept clean and free of dust buildup. Wipe down all exposed flat surfaces with a soft rag. If allowed in the facility, use light air pressure to blow the press head and structure areas from the top down.

12.3. Inspection

Visually inspect the press head area. The top sheet metal housing or front cover panel should be removed once per year to allow a thorough inspection. See Section 12.1 for procedure to remove top housing.

Whenever the top sheet metal housing is removed (CBP) or the rear electrical cabinet is opened (CMP), the main power surge protector should be checked. The surge protector is located far left of the panel's DIN rail. With the machine energized, verify that the green LED on the surge protector is illuminated. If not, it is likely the machine has been exposed to one extreme voltage surge or several significant surges, such as might be generated by nearby lightning strikes to the power lines supplying the facility.

If the LED is not illuminated, the machine will still operate but is no longer protected from potentially destructive power line events. Replace the surge protector to restore protection.

12.4. Light Curtain Interlock

The Light Curtain is the primary operator safety device. When the light curtain senses an obstruction, the EMO circuit is de-energized, and motion is halted. To insure safe operation, the light curtain requires periodic checks.

Refer to the Light Curtain's user manual for instructions on performing the periodic test using the supplied test wand for proper and safe operation.

12.5. Lubricating

Light machine oil or 30W non-detergent motor oil should be used in the following areas of the machine:

A. Z Axis Rods

With the Z axis in the down position, put a small amount of oil on the rods above each of the linear guide bushings. Grease linear bushings thru grease fittings.

B. Z Axis Screw

With the Z axis in the down position, put a small amount of oil on the screw and wipe down with a rag. There should only be a thin coating of oil remaining. Grease thru grease fitting on nut.

12.6. Torquing Critical Bolts

NOTE
This procedure requires the top sheet metal housing to be removed on CBP (see Section 12.1 for procedure details). The critical bolts on the pressing head should be checked for proper torque. The Z axis bearing housing is a 50 mm 1.97 in.] thick block, mounted to the top of two upright plates with 6 M10 x 1.5 socket head bolts. Torque bolts to 90 Nm [66.4 lbft].

12.7. **PM Schedule**

Figure 98 provides a preventative maintenance schedule for these machines.

ITEM	DAILY	WEEKLY	QUARTERLY	YEARLY
Blow Machine Off	●			
Wipe Machine Down		●		
Inspect Wires and Hoses			●	
Oil as Indicated Above			●	
Torque Head Bolts				●
Drain Moisture Separator				●
Calibrate Z Axis Load Cells				●
Inspect Ball Screw				●

Figure 98

APPENDIX A – SPARE PARTS

CBP Spare Parts List

TE PART NUMBER	DESCRIPTION	REVISION
2216929-2	KIT, CXP SPARE PARTS	B

NOTES:
- Identify kit per TE Specification 115-67-12 (part number, revision letter, and country of origin)
- Kit 2216929-2 is used with all top level CBP configurations (refer to drawing 2216056)

CBP with Stand Spare Parts List

TE PART NUMBER	DESCRIPTION	REVISION
2216929-1	KIT, CXP SPARE PARTS	B

NOTES:
- Identify kit per TE Specification 115-67-12 (part number, revision letter, and country of origin)
- Kit 2216929-1 is used with all top level CBP with stand configurations (refer to drawing 1-2216056-1/2)

CSP Spare Parts List

TE PART NUMBER	DESCRIPTION	REVISION
2216929-1	KIT, CXP SPARE PARTS	B

NOTES:
- Identify kit per TE Specification 115-67-12 (part number, revision letter, and country of origin)
- Kit 2216929-1 is used with all top level CSP configurations (refer to drawing 2216055)

CMP Spare Parts List

CMP-5T

TE PART NUMBER	DESCRIPTION	REVISION
2216259-1	KIT, SPARE PARTS CMP-5T	A

NOTES:
- Identify kit per TE Specification 115-67-12 (part number, revision letter, and country of origin)

CMP-10T

TE PART NUMBER	DESCRIPTION	REVISION
2216260-1	KIT, SPARE PARTS CMP-10T	A

NOTES:
- Identify kit per TE Specification 115-67-12 (part number, revision letter, and country of origin)

APPENDIX B – FEATURES & SPECIFICATIONS

Features

- SPC calculation, display, log & print
- Touch screen monitor
- On-line setup drawings and photographs
- Operator log in & out with password protection
- Multiple operator levels for limiting function access
- Error log with date, time & operator information saved to disk
- Maintenance & setup software utilities
- Graphic display of board in process
- Force-Vs-distance on-screen graphs
- Software controlled pressing profile with error detection and user defined messages
- Electric servo pressing (Z axis)
- High rigidity: 2 large Z axis guide rods with linear bearings
- Press to force
- PCB thickness measurement and press to height
- PARS and Force Gradient pressing
- Missing connector detection
- Clean & Quiet
- Energy efficient
- CE Compliant

Specifications

CBP-5T Mk II

- Force: 44 kN [5 ton]
- Force sensitivity: 50 N [12 lbf]
- Z axis travel: >50 mm [2 in.]
- Z axis speed: up to 8 mm [.31 in.]/sec
- Power: 200-240 VAC, 1 Phase, 6 A
- Dimensions:
  For Standard Benchtop Machine:
  766 mm Wide X 612 mm Deep X 960 mm High [31 in. Wide X 25 in. Deep X 38 in. High]
  For CBP-5T with Stand (1-2216056-1/2):
  766 mm Wide X 612 mm Deep X 1775 mm High [31 in. Wide X 25 in. Deep X 69.6 in. High]
- Weight:
  For Standard Benchtop Machine: Approximately 180 kg (400 lbs)
  For CBP-5T with Stand (1-2216056-1/2): Approximately 270 kg (600 lbs)

CSP-5T Mk II

- Force: 44 kN [5 ton]
- Force sensitivity: 50 N [12 lbf]
- Z axis travel: >50 mm [2 in.]
- Z axis speed: up to 8 mm [.31 in.]/sec
- Power: 200-240 VAC, 1 Phase, 6 A
- Dimensions: 836 mm Wide X 665 mm Deep X 1775 mm High [32.9 in. Wide X 26.2 in. Deep X 69.6 in. High]
- Weight: Approximately 270 kg (600 lbs)

CMP-5T Mk II

- Force: 53 kN [6 ton]
- Force sensitivity: 80 N [18 lbf]
- Z axis travel: >130 mm [5 in.]
- Z axis speed: up to 30 mm [1.2 in.]/sec
- Power: 200-240 VAC, 1 Phase, 10 A
- Dimensions: 1270 mm Wide X 915 mm Deep X 1780 mm High [50 in. Wide X 36 in. Deep X 70 in. High]
- Weight: Approximately 680 kg (1500 lbs)

CMP-10T Mk II

- Force: 106 kN [12 ton]
- Force sensitivity: 100 N [23 lbf]
- Z axis travel: >130 mm [5 in.]
- Z axis speed: up to 19 mm [.75 in.]/sec
- Power: 200-240 VAC, 1 Phase, 10 A
- Dimensions: 766 mm Wide X 612 mm Deep X 960 mm High [31 in. Wide X 25 in. Deep X 38 in. High]
- Weight: Approximately 1130 kg (2500 lbs)

Options

- Bar Code Scanner
- ACAL Unit
- PPS Tooling (CSP 5T Mk II only)

Updates

For information on how to obtain the latest version of the C*x*P Operating System, call (888) 782-3349 or visit our website at www.tooling.te.com.

APPENDIX C – ELECTRICAL/MECHANICAL SCHEMATICS

CBP-5T, CMP-5T, AND CMP-10T

TE DWG NUMBER	DESCRIPTION	REVISION
2216706	SCHEMATIC, ELECTRICAL	B

CSP-5T

TE DWG NUMBER	DESCRIPTION	REVISION
2216052	SCHEMATIC, ELECTRICAL	B

13. REVISION SUMMARY

Since the last revision of this document, the following changes were made:

- Adding the details for new machine CBP Stand 1-2216056-2.