1 Introduction

This instruction sheet describes the basic operation of the TE Crimp Quality Monitor (CQM) that is integrated with the Segmented Radial Crimp (SRC) machine and how the two interact.

The CQM is a process monitoring tool. It is influenced by many variables, including changes in wire size, terminal, die, operator, and environment. Changes in any of these variables can affect the process, which must be relearned. The settings provided in this instruction sheet produce consistent results with the variables and behaviors unique to the SRC machine.

This instruction sheet supplements (but does not replace) the manuals for the SRC machine and the CQM (Table 1). Read and understand both customer manuals before using the equipment.

Table 1: Manuals

Manual title	Document number
Segmented Radial Crimping Machine	409-39032
Crimp Quality Monitor II	409-10100

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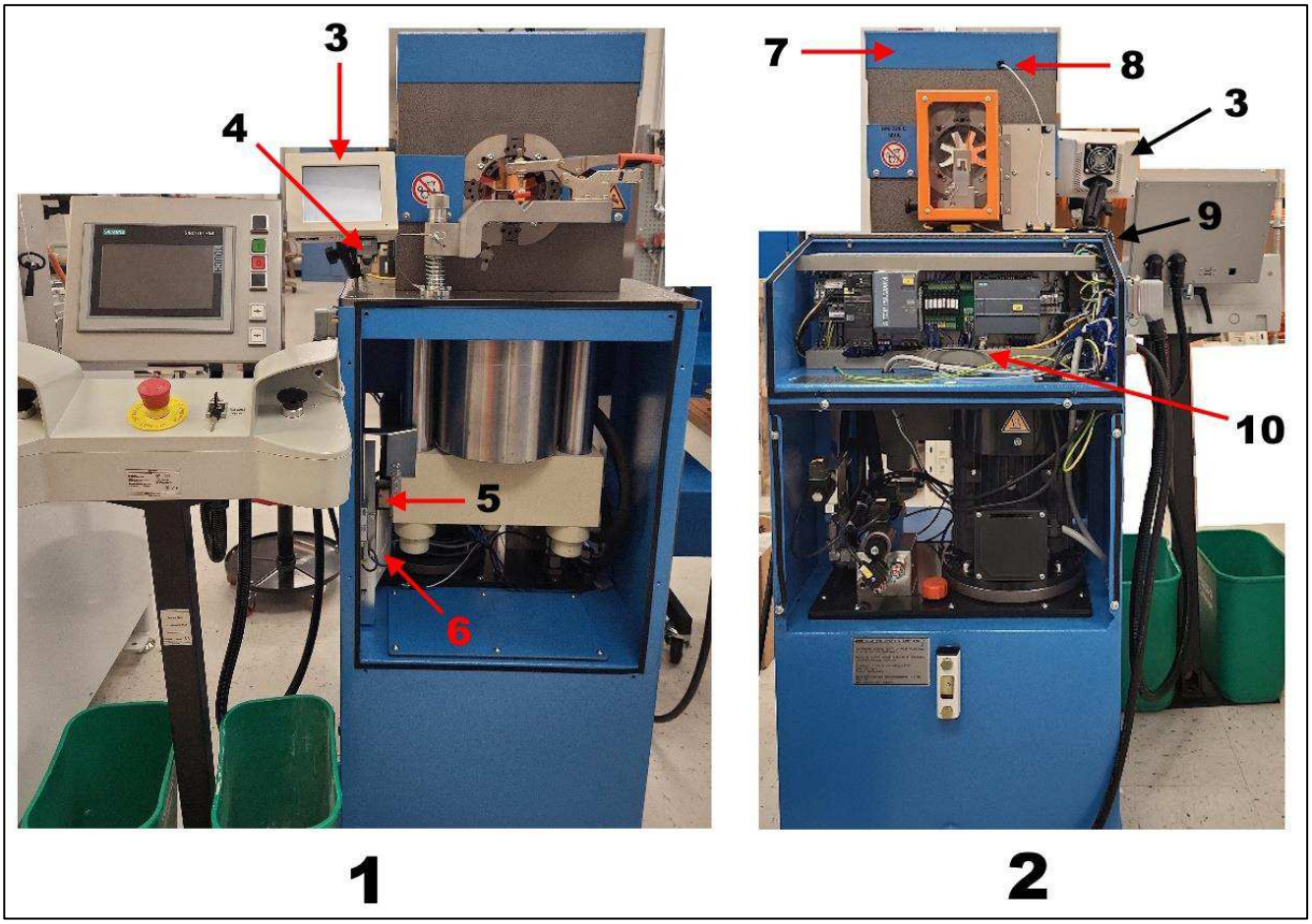
2 CQM system

Figure 1 shows the parts that have been added to the machine for the CQM system.

Figure 1: Parts added for CQM system



1 Front view
2 Rear view
3 CQM host module assembly
4 Controller Area Network (CAN) cable
5 Encoder read head and magnetic strip
6 Data Acquisition Module assembly
7 Top cover
8 Micro Strain Force Sensor and cable
9 Cable routing (force sensor and CAN cables)
10 Data Acquisition Module interface and power cables

2.1 Host module

The host module is mounted on the left side of the machine (as viewed from the front). It provides a graphical interface that enables you to change process monitoring setting and view the data processed by the CQM. This interface displays information on passed crimps, failed crimps, and crimp settings.

2.2 Data Acquisition Module

The Data Acquisition Module (DAQ) module is mounted in the front left of the machine in the main motor cabinet. The DAQ is an essential part of the CQM. It is the point of connection for the CQM system sensors, and contains hardware to condition the signals received.

2.3 Micro Strain Force Sensor

The Micro Strain Force Sensor is mounted on top of the press, below a top guard, with cabling that runs down the rear of the machine, into the electrical enclosure, and down to the DAQ module.

The Micro Strain Force Sensor collects force data from the press as the crimp is formed. The CQM measures small deflections in the frame of the press. These deflections serve as a force measurement and are used to monitor the crimp process.

2.4 Magnetic Linear Encoder

The Magnetic Linear Encoder is mounted to capture movement from the ram inside the main enclosure and has an integrated cable that connects to the DAQ module. It tracks the vertical movement of the press performing the crimp motion. For correct data interpretation by the CQM, the crimp must be a complete cycle, with a cyclical down and up action over matching distances for the two parts.

2.5 Cabling for integration

In addition to the cables from the Micro Strain Force Sensor and the Magnetic Linear Encoder, several other cables are required for the CQM to function (Table 2).

Table 2: Cables

Cable	Purpose
DAQ power	Provides power from the DAQ and Host module
DAQ interface	Connects the CQM to the SRC machine for necessary interfacing
CAN	Connects the Host Module to the DAQ module

3 Configuring the CQM

The following settings must be set on the CQM for use on the SRC. Double-check these settings before running the machine.

To navigate to these settings, complete the following steps:

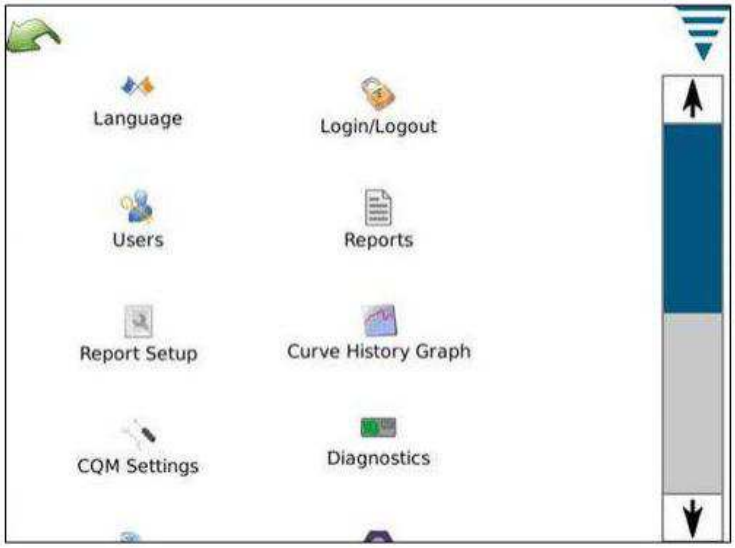
1. Touch the down arrow in the upper right corner. The menu bar is displayed (Figure 2).

Figure 2: Menu bar

1 Back arrow
2 Home screen
3 Help
4 Screen name and number
5 Control Panel
6 Time and date
7 Collapse menu

2. Touch the **Control Panel** button. The Control Panel is displayed (Figure 3).

Figure 3: Control Panel



3. Find the icon for the setting you want to check (scrolling down, if necessary) and touch it.

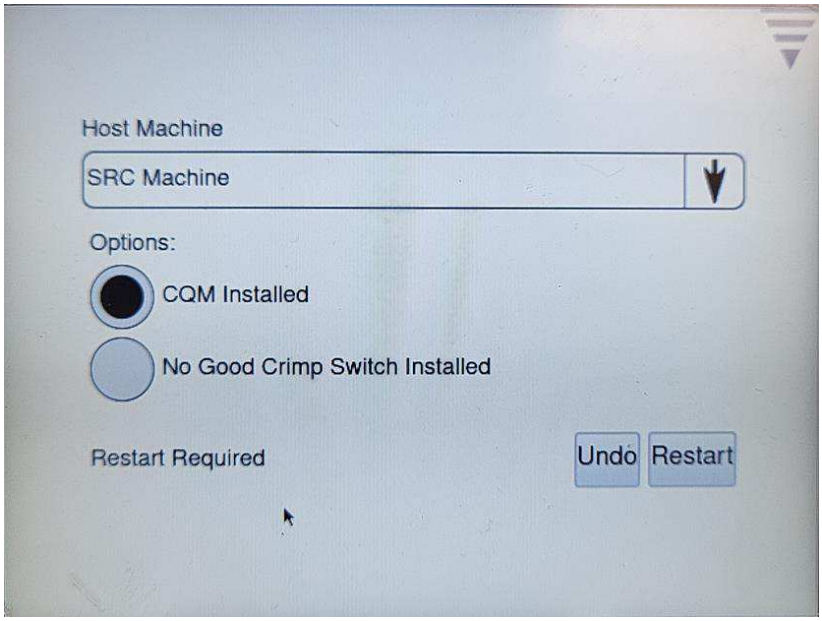
3.1 System settings

1. On the Control Panel, touch the **System Settings** button. The system settings screen is displayed (Figure 4).
2. Verify that the settings are as listed in Table 3.
3. If you changed any settings, touch the **Restart** button.

Table 3: System settings

Setting	Value
Host Machine	SRC Machine
Options	CQM Installed

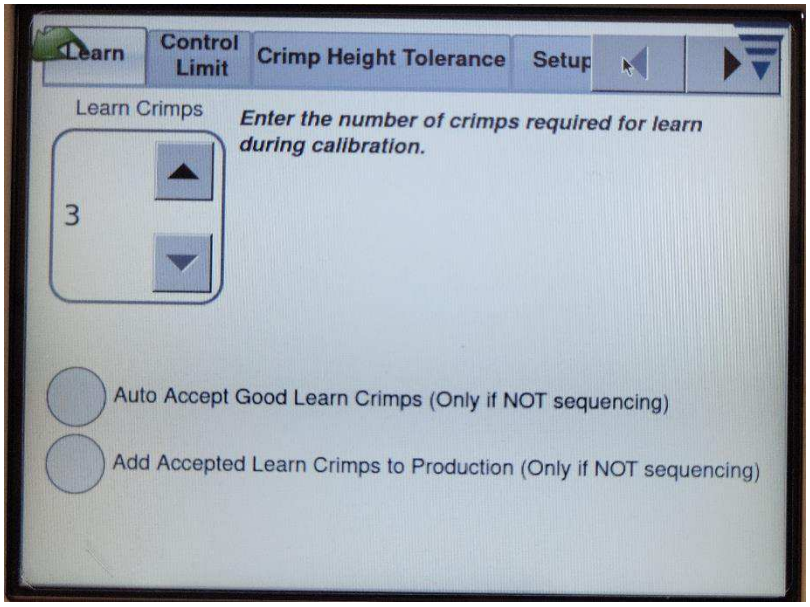
Figure 4: System settings



3.2 CQM settings

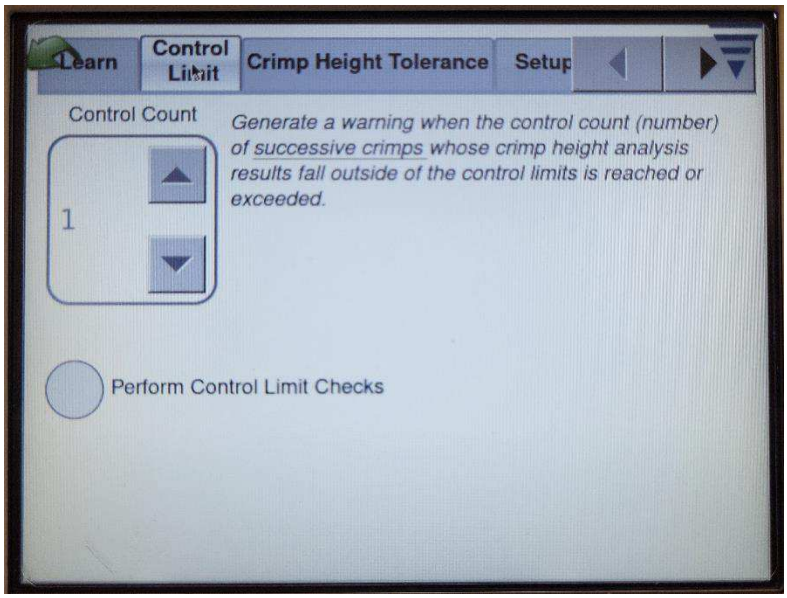
1. On the Control Panel, touch the **CQM Settings** button. The CQM settings are displayed, with the **Learn** tab selected (Figure 5).
2. Set **Learn Crimps** to the number of crimps you want to use for the learning process.
   - The minimum value is 3.
   - More learn crimps provide a better analysis of the process.
   - A value of 5 or more is recommended.

Figure 5: Learn tab



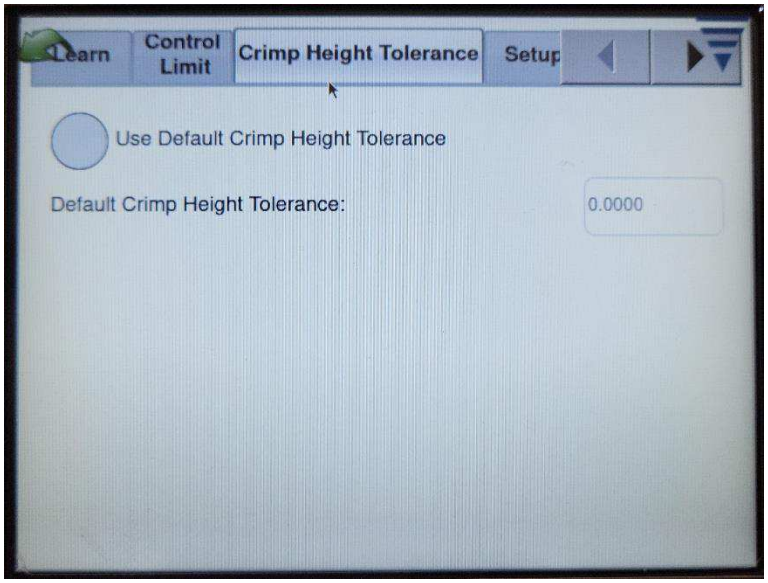
3. Touch the **Control Limit** tab. The control limit settings are displayed (Figure 6). They are disabled.

Figure 6: Control Limit tab



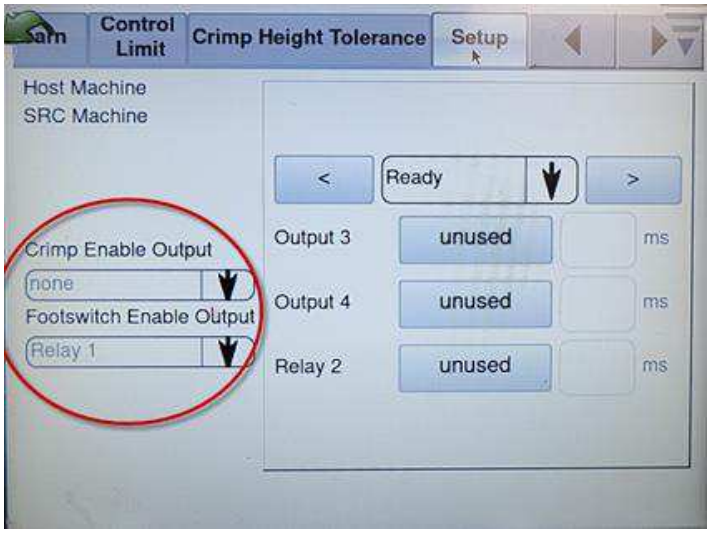
4. Touch the **Crimp Height Tolerance** tab. The crimp height tolerance settings are displayed (Figure 7). They are disabled.

Figure 7: Crimp Height Tolerance tab



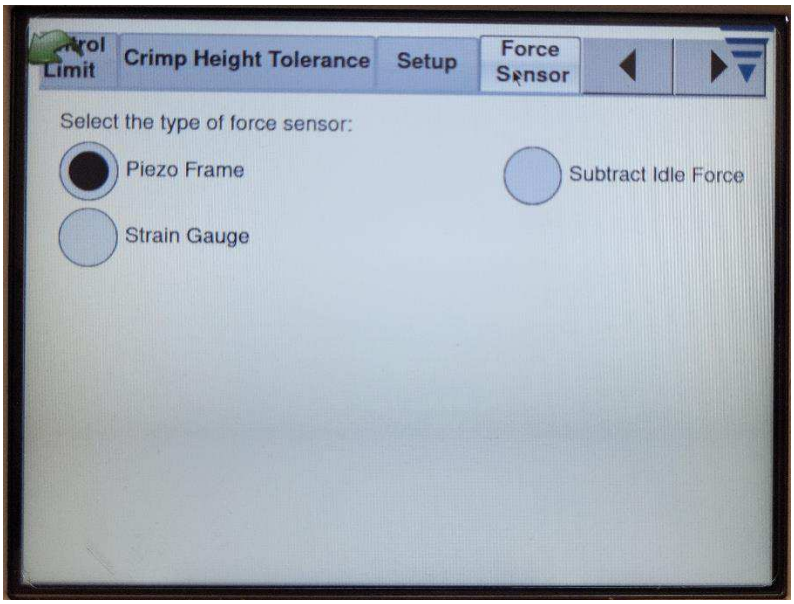
5. Touch the **Setup** tab. The setup settings are displayed (Figure 8).
6. Verify that **Footswitch Enable Output** is set to **Relay 1**. (This setting cannot be changed.)

Figure 8: Setup tab



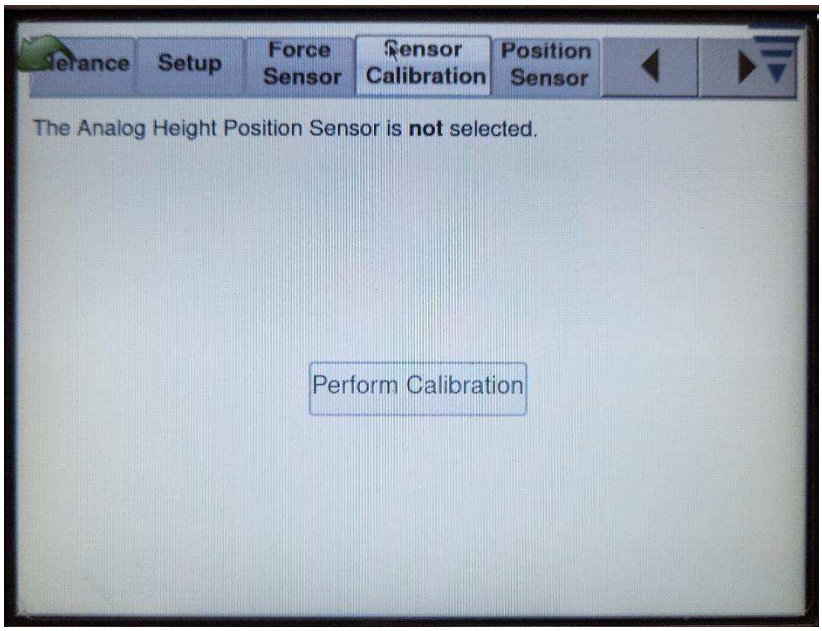
7. Touch the **Force Sensor** tab. The force sensor settings are displayed (Figure 9).
8. Ensure that the **Piezo Frame** is selected.

Figure 9: Force Sensor tab



9. Touch the **Sensor Calibration** tab. The sensor calibration settings are displayed (Figure 10). They are disabled.

Figure 10: Sensor Calibration tab

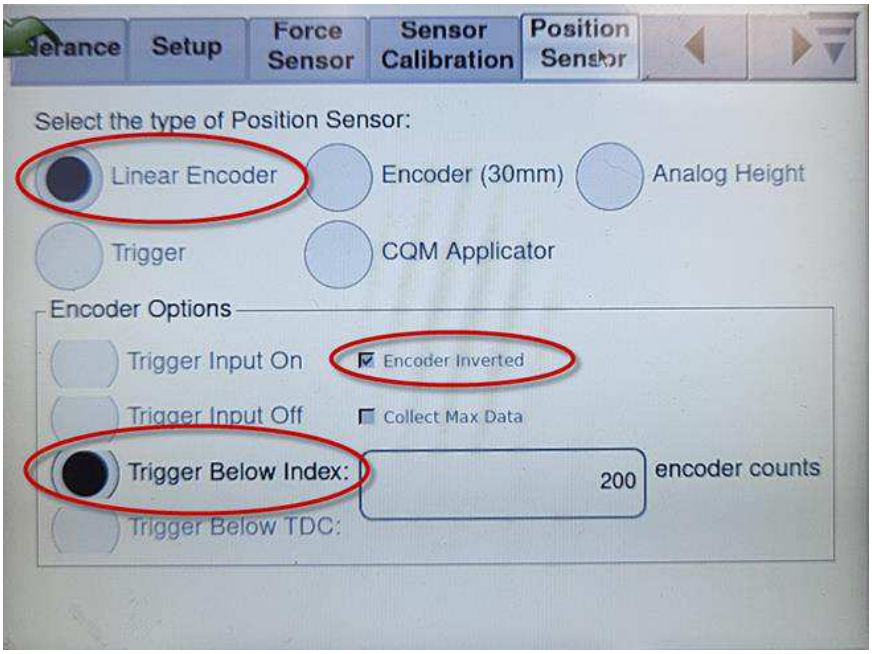


10. Touch the **Position Sensor** tab. The position sensor settings are displayed (Figure 11).
11. Verify that the settings are as listed in Table 4.

Table 4: Position Sensor settings

Setting	Value
Type of Position Sensor	Linear Encoder
Trigger Below Index	Selected
Encoder Inverted	Enabled
Encoder counts	200

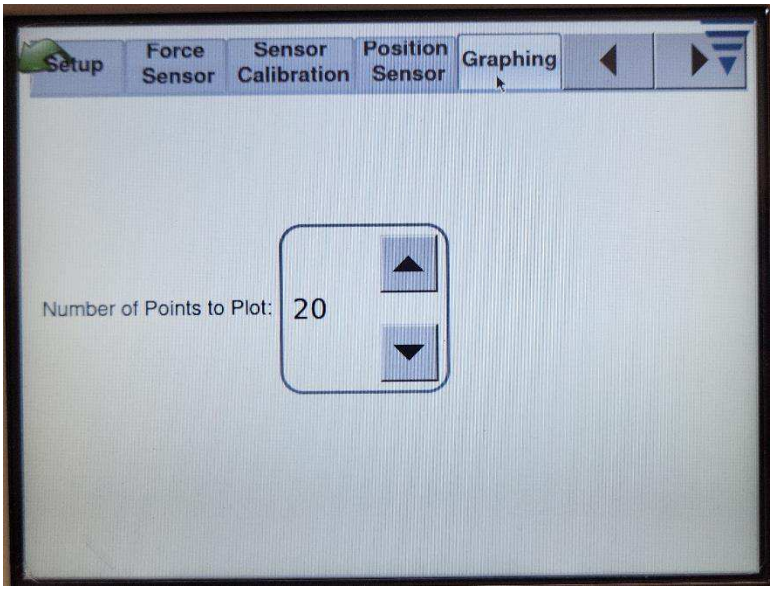
Figure 11: Position Sensor tab



12. Touch the **Graphing** tab. The graphing settings are displayed (Figure 12).
13. Verify that **Number of Points to Plot** is set to 20.

NOTE
This value can be adjusted to change the appearance and precision of the force graph created after a crimp.

Figure 12: Graphing tab



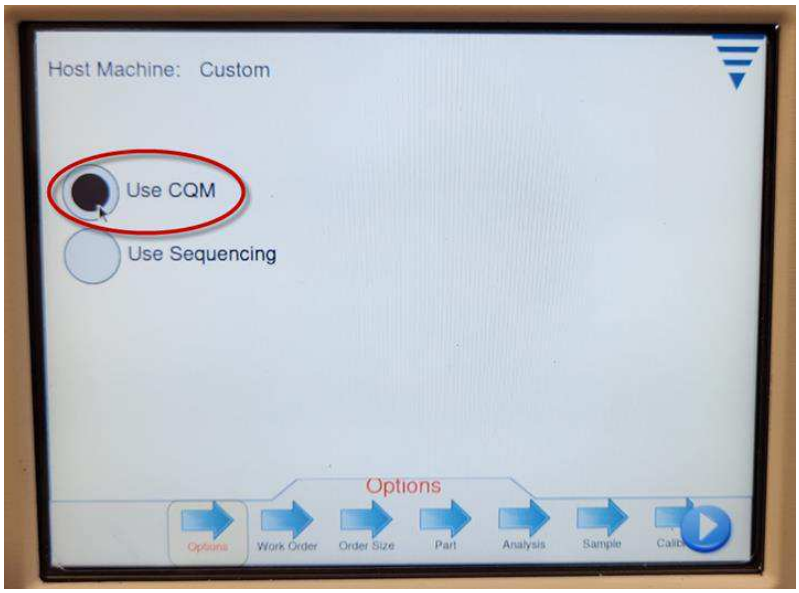
4 Operating the SRC with the CQM

The following instructions refer to completing tasks on the CQM Host Module and SRC control panel.

- For specific instructions for programming of the SRC machine for a production crimp cycle, refer to the SRC manual (Table 1).
- For general operation and programming of the CQM, refer to the CQM manual (Table 1).

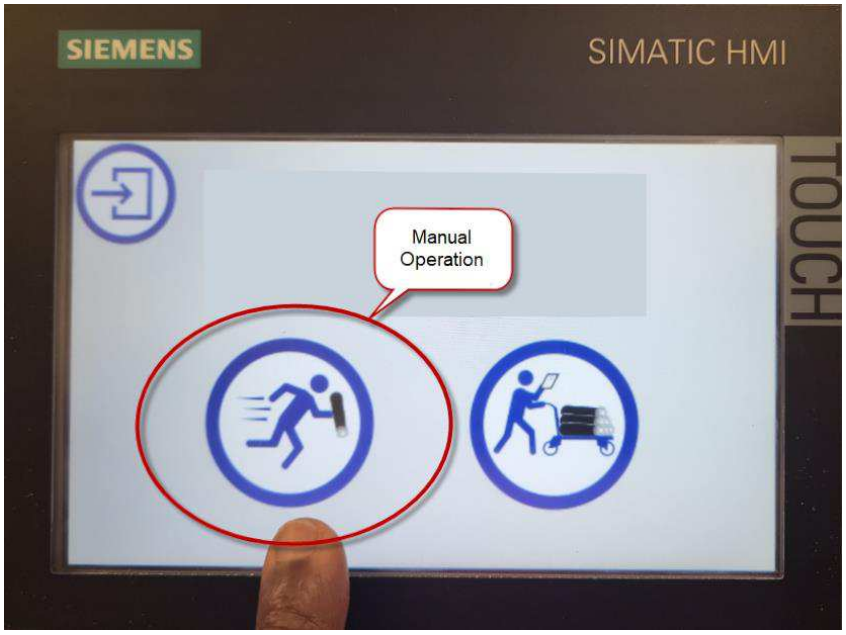
1. On the Option screen of the host module, select **Use CQM** (Figure 13).

Figure 13: Option screen



2. On the Start screen of the SRC Control Panel, touch the **Manual Operation** button (Figure 14).

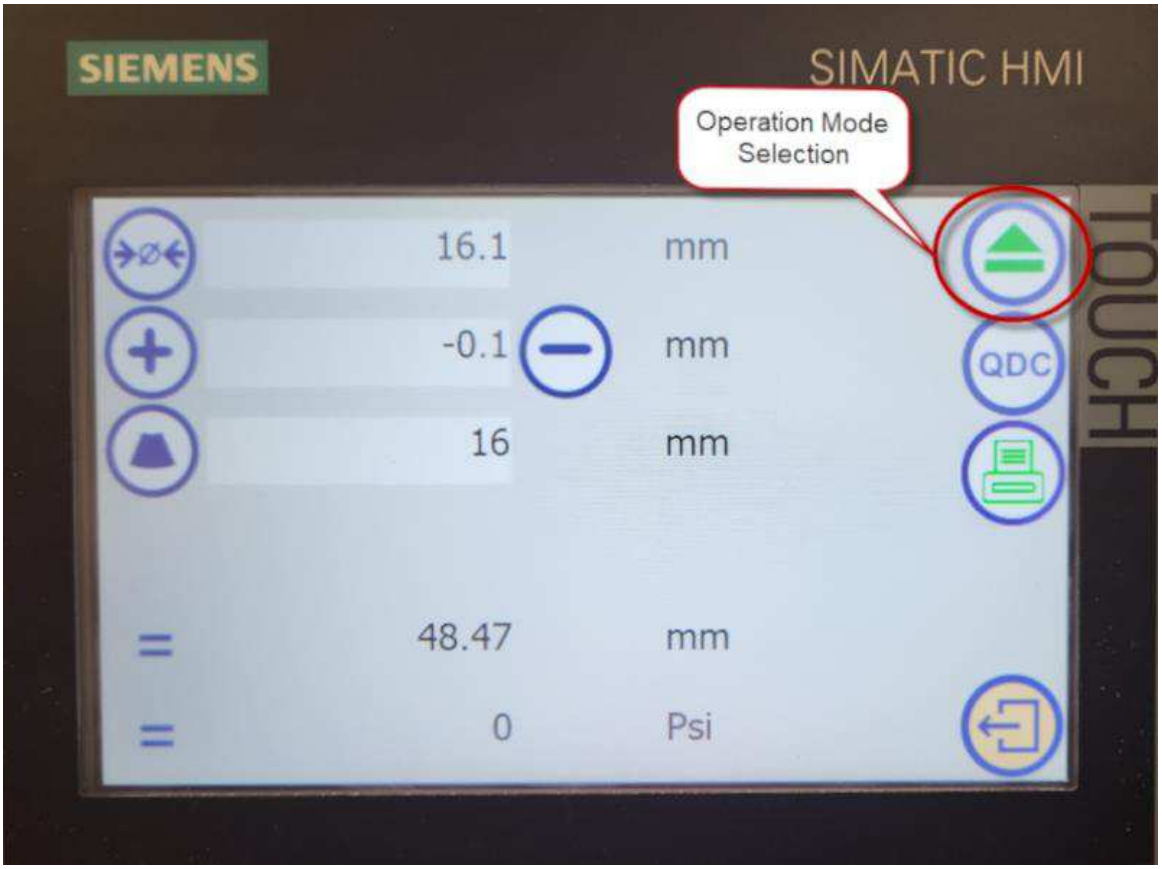
Figure 14: Selecting manual operation



3. To change the operating mode, find the **Operation Mode Selection** button on the SRC Control Panel (Figure 15).

NOTE
*For CQM to operate correctly, the SRCmust be used in automatic mode. In manual mode, the CQM does **not** properly detect crimps and interrupts normal crimping operation of the SRC.*

Figure 15: Selecting the operating mode



4. Tap the button until the appropriate icon is displayed (Table 5).

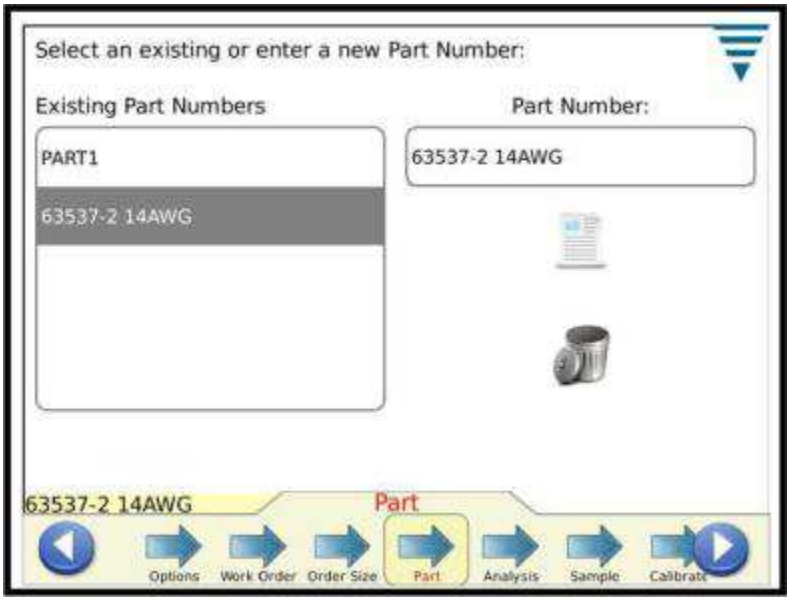
Table 5: Operation Mode icons

Icon	Operation mode	Description
	Manual	The tool does not automatically reopen after the crimping process.
	Semi-automatic	The tool automatically opens after the forming process. This mode is required for crimp detection with the CQM.

5. Setup SCR parameters for crimp. Refer to the SCR manual for details (Table 1).
6. On the CQM Host, proceed through the screens in production mode using the right arrow. Enter **Work Order** and **Order Size** values on the appropriate screens. Refer to the CQM manual for details (Table 1).

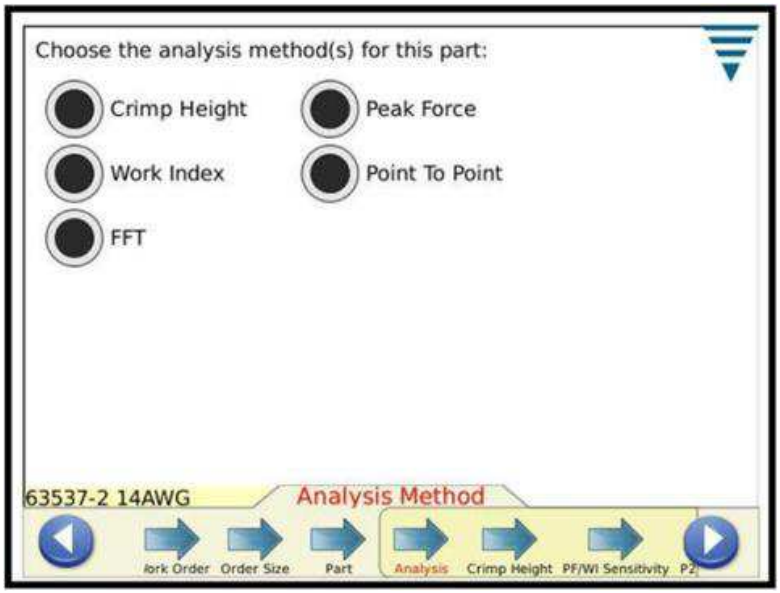
7. On the CQM Host, proceed to the Part screen (Figure 16). Enter part data or select the appropriate part.

Figure 16: Part screen



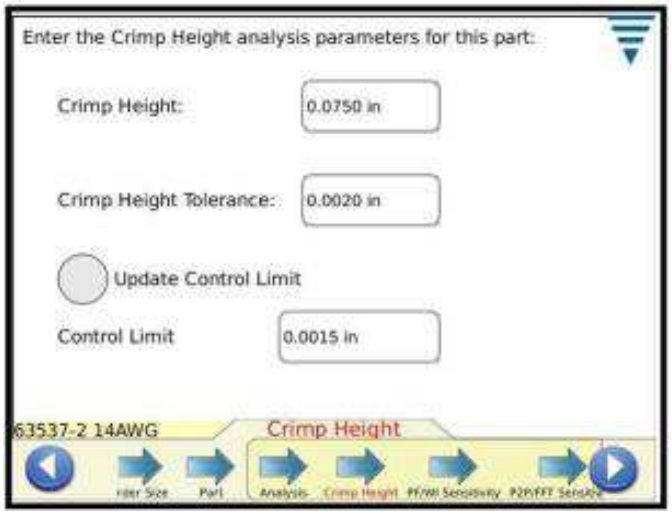
8. On the CQM Host, proceed to the Analysis screen (Figure 17). Select all analysis methods.

Figure 17: Selecting analysis methods



9. On the CQM Host, proceed to the **Crimp Height** tab (Figure 18). Enter a crimp height value for the terminal being used and the required height tolerance and control limit.

Figure 18: Entering the crimp height

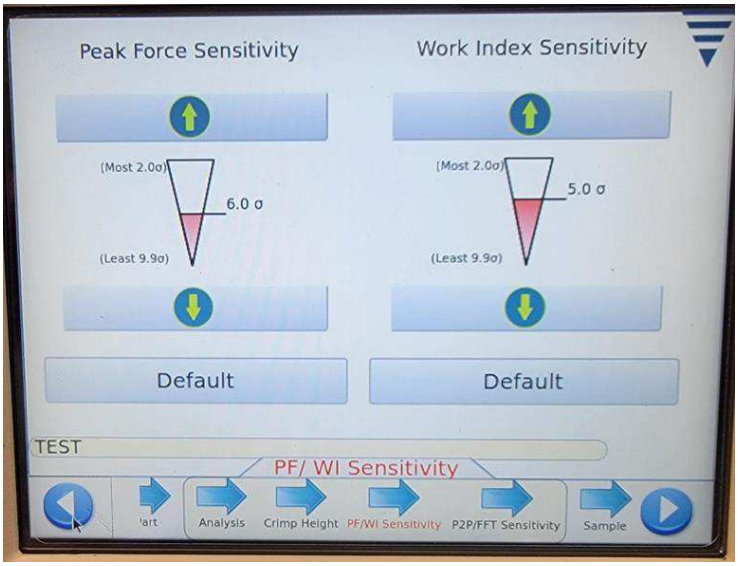


10. On the CQM Host, proceed to **PF/WI Sensitivity** (Figure 19). Adjust the values as needed for accurate results. The settings listed in Table 6 have yielded consistent CQM results. Refer to the CQM manual (Table 1) for more details on adjusting these values.

Table 6: Peak Force and Work Index Sensitivity

Setting	Value
Peak Force Sensitivity	6.0σ
Work Index Sensitivity	5.0σ

Figure 19: Peak Force and Work Index Sensitivity

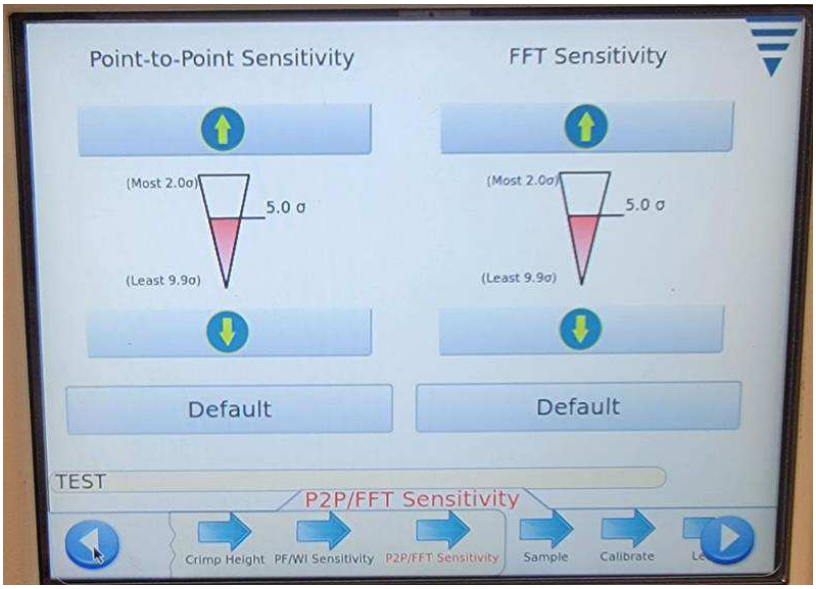


11. On the CQM Host, proceed to **P2P/FFT Sensitivity** (Figure 20). Adjust the values as needed for accurate results. The settings listed in Table 7 have yielded consistent CQM results. Refer to the CQM manual (Table 1) for more details on adjusting these values.

Table 7: Point-to-point and FFT Sensitivity

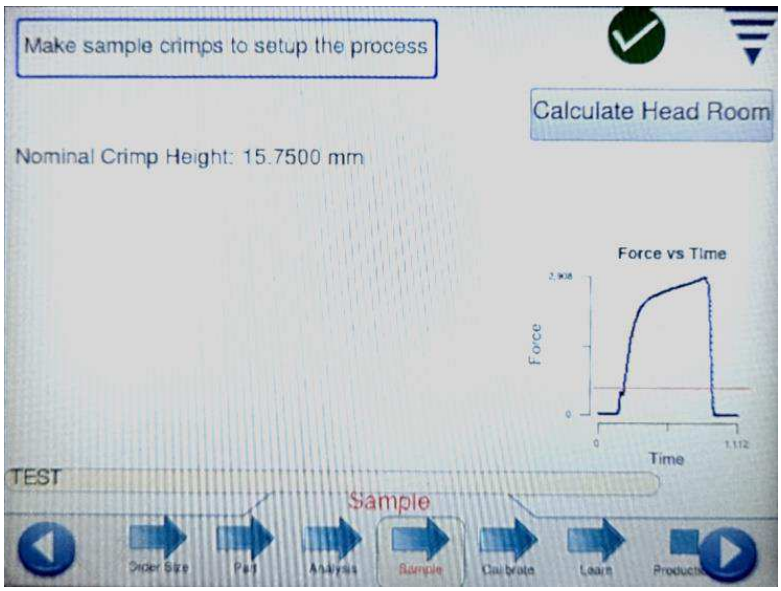
Setting	Value
Point-to-Point Sensitivity	5.0σ
FFT Sensitivity	5.0σ

Figure 20: Point-to-point and FFT Sensitivity



12. On the CQM Host, proceed to the **Sample** screen (Figure 21). Make sample crimps to check for correct crimp. Adjust the close position (crimp height) on the SRC Control Panel until the required crimp is achieved.

Figure 21: Sample screen



13. For new parts, you can request an optional headroom calculation to estimate how accurately the CQM can monitor the system with the chosen terminal and die set.

    a. Touch the **Calculate Headroom** button.

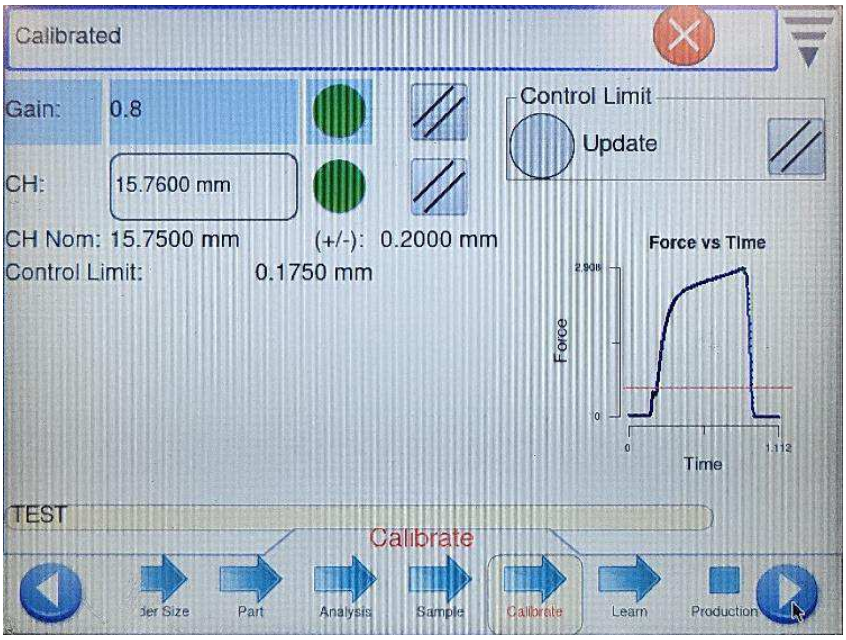
    b. When prompted, perform a good crimp with wire in the terminal, then crimp a terminal without wire. Sometimes the CQM prompts for two crimps of a terminal with wire.

    The headroom is automatically calculated using these two crimps. Refer to the CQM manual (Table 1) for more details on the headroom calculation.

    - If the headroom calculation is 35% or above, good results are expected for monitoring on the CQM.
    - If the headroom value is less than 35%, expect poor monitoring (bad crimps can pass and otherwise good crimps can fail).

14. On the CQM Host, proceed to the **Calibrate** tab (Figure 22).

Figure 22: Calibrate tab

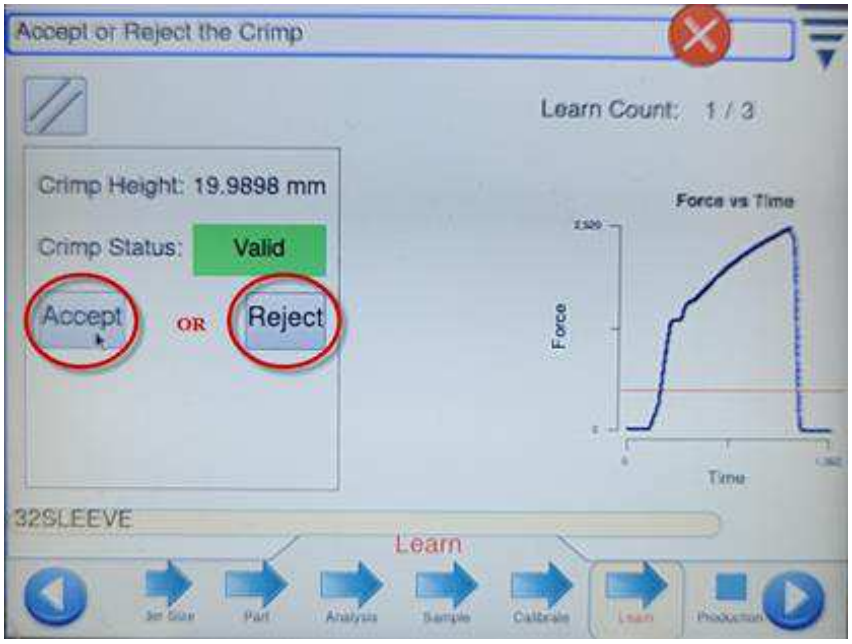


15. If the part selected is a new part that has not been set up before, a gain calibration is required. Follow the on-screen prompts to crimp a terminal with wire to set the gain. If the crimp is not satisfactory, reset the gain and perform the crimp again.

16. When the crimp height analysis method is selected, enter the crimp height of the crimped terminal.

17. On the CQM Host, proceed to the **Learn** tab (Figure 23). Perform the learn process as outlined in the CQM manual (Table 1). Before accepting a crimp, ensure that the crimp is satisfactory. Do not accept an unsatisfactory crimp.

Figure 23: Learn tab



18. After the Learn process is complete, proceed to **Production**. In Production mode, crimps can be made at will. Ensure that the crimp is continuous by holding down **both** palm buttons on the two hand touch control module until the crimp is complete (the die has closed and opened completely).

The CQM analyzes each crimp.

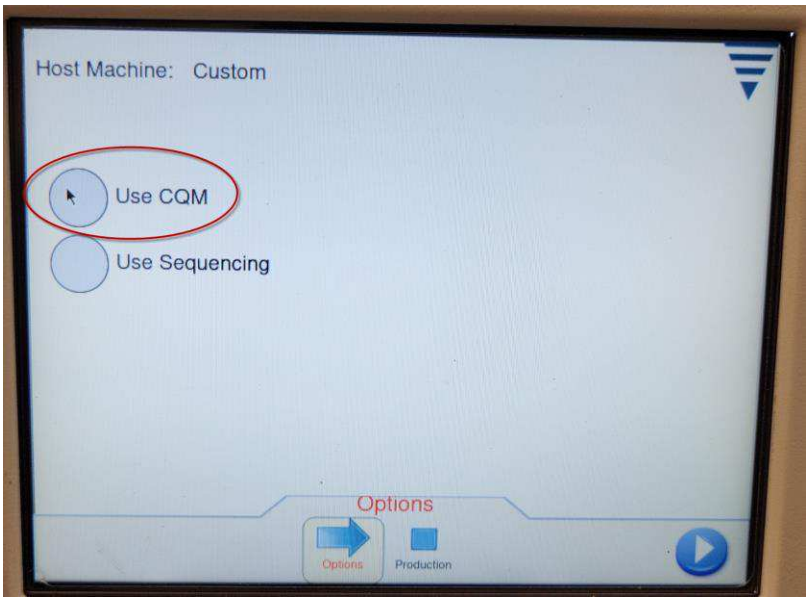
- When the CQM registers a good crimp, the system can be cycled again.
- When a bad or failed crimp occurs, two-hand operation is disabled until the failed crimp message is cleared on the CQM screen.

5 Operation of the SRC-300 without the CQM

To crimp without CQM enabled, complete the following steps.

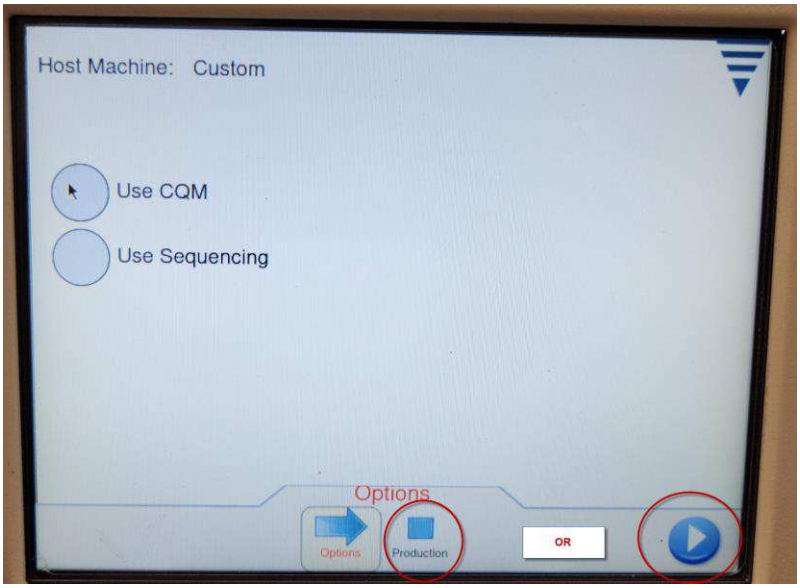
1. On the host Module Option screen (Figure 24), ensure that **Enable CQM** is not selected.

Figure 24: Disabling CQM



2. Touch the **Production** button (Figure 25) to enable crimping with CQM disabled.

Figure 25: Selecting production

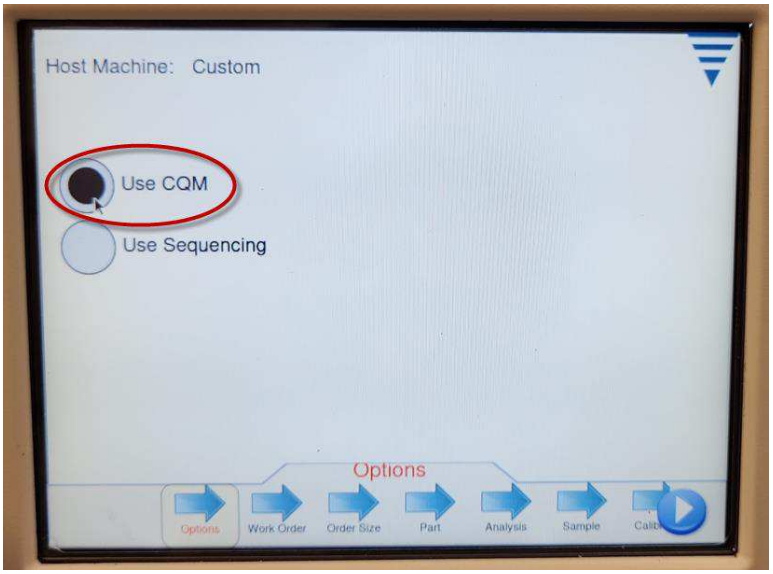


3. To return to operation using the CQM, touch the blue arrow in the lower left corner of the CQM host screen (Figure 26) while in Production mode.

Figure 26: Return to operation button

4. Select **Use CQM** (Figure 27).Refer to section 4 for instructions on operation of the SRC with the CQM.

Figure 27: Enabling CQM



6 Die changes on the SRC with the CQM

1. Operate the SRC without CQM as described in section 5.
2. Change the dies as described in the SRC manual (Table 1).
3. On the CQM host, touch the blue arrow in the lower left corner (Figure 26) to exit production mode with the CQM disabled.
4. On the main screen, select **Use CQM**.
5. Repeat the Learn process as outlined in the CQM manual (Table 1).

7 Revision summary

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

- Initial release