

SMEMA INTERFACE

The SMEMA Interface is:

☐ Standard, (installed on all ovens) ☒ An option, (NOT installed on all ovens)

DESCRIPTION

(SMEMA is the acronym for Surface Mount Equipment Manufacturer's Association)

The SMEMA electrical interface option for the Reflow Oven is intended to comply with the SMEMA Electrical Interface Standard 1.2. It provides signals from the Reflow Oven to the upline/downline equipment in the process line.

A PLC is mounted inside the electrical enclosure; a photo-sensor is mounted on brackets above each end of the conveyor(s). A 14 pin round connector is mounted on each end of the Reflow Oven. The SMEMA interface receives power from the Reflow Oven to operate. (The PLC operates two SMEMA circuits.) The SMEMA interface accepts a 'Board Available' signal from the upline (onload side) of the Reflow Oven on pins 3&4 of the onload connector. It replies with a 'Busy' signal on pins 1&2 of the onload connector to the machine upline. On the downline (offload) side, a 'Board Available' signal is sent on pins 3&4 and looks for a 'Busy' signal to come back on pins 1&2 of the offload connector. Because the Reflow Oven should not be stopped with product in the heat zone, the busy signal coming from the downline end is used to generate the busy signal for the upline equipment without stopping the Reflow Oven. When all of the conditions are 'False', the Reflow Oven is "not busy" and will accept more product from the upline equipment. If any of the conditions are 'True', the Reflow Oven will transmit a "busy" signal to the upline equipment. This should stop the upline equipment from sending product to the Reflow Oven, thus preventing a product buildup.

The upline "busy" signal can be a result of one (or more) of the following:

1. Board at 'on-load'
2. Board Jam at off-load
3. Downline machine has not sent 'ready' signal for 2 boards
4. Oven is NOT 'Process Ready'
5. The (settable) spacing between boards has not been satisfied.

The busy signal from the Reflow Oven to the upline piece of equipment is designed to provide a space equal to approximately 1/2 the product length between each product under normal operation. The board available signal sent from the upline equipment is not implemented because the oven should not be stopped and started. The board available signal sent from the Reflow Oven to downline equipment is a notification of product coming out of the oven.

When a board's leading edge passes under the onload sensor it triggers the busy signal to be true (on) for 1.5 board lengths. This tells the upline equipment feeding the Reflow Oven to wait for 1.5 board lengths before feeding another piece to the Reflow Oven. When the board exits the oven and the leading edge passes under the offload sensor, it triggers the board available signal to go true (on) 1 second later and to stay true for one board length. This signals the downline equipment receiving product from the Reflow Oven to expect a board at that time. The 1-second delay is to ignore false signals created when the photocell senses the conveyor belt.

The PLC controls the delays and triggers the operation of the interface off of the process ready signal. If the machine is NOT process ready, the SMEMA interface will signal busy to the upline equipment.

SETUP

The SMEMA interface requires that the connections be made between adjoining machines and the Reflow Oven, using the SMEMA connectors at the onload and offload ends. The PLC is pre-programmed and the sensors are preset at the factory. The SMEMA interface is installed and fully tested at the factory before shipping. The user should not need to adjust the SMEMA interface after initial connections have been made.

OPERATION

Action by the Reflow Oven operator is not necessary for the SMEMA interface to function. As long as the upline / downline connections are made and a component failure has not occurred, operation will be automatic when the Reflow Oven is powered up.

NOTE

Ovens with a Dual Rail conveyor (with two sets of rails and chains) have two separate sets SMEMA Interface sensors making separate input(s) to the PLC.

Each conveyor must be ready to receive product before it independently sends a "Ready" signal to its respective "upline" equipment.

Either conveyor can send a "Product at Offload" signal to the "downline" equipment.

SMEMA machine interface
for Vitronics SMEMA04 January 22, 2004
using the **Allen Bradley MicroLogix** 1200 PLC.

There are two test procedures below. The first test is for PLC units that are installed in an oven, and the second is for PLC units being tested separately from the oven (stand-alone). The stand-alone test specifies input and output connections instead of devices (sensors, upstream / downstream machines, etc.). The tests are otherwise identical.

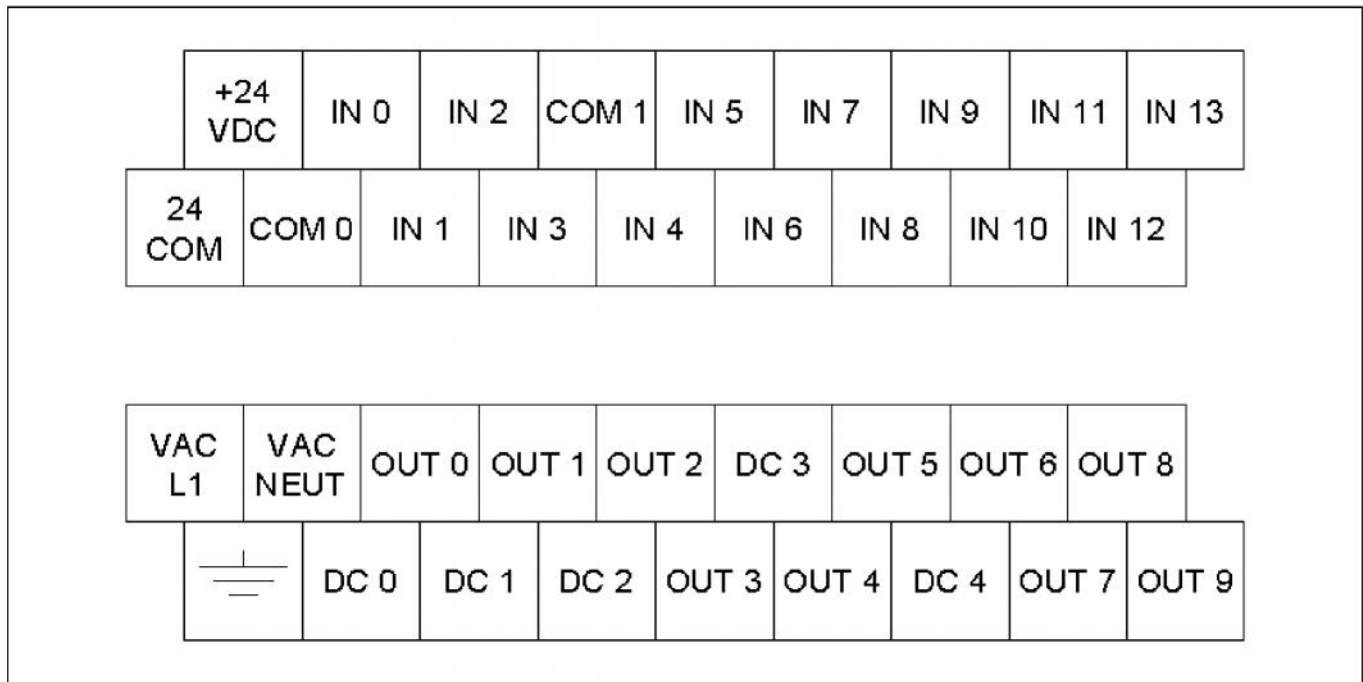
Allen Bradley MicroLogix 1200
PLC Terminal Connections

| PLC terminal | Wire # | Description |
|--------------|--------|---|
| 24 COM | 2007 | DC common from PLC, On-load (SX200-4,SX201-4), Off-load (SX202-2,SX203-2) |
| 24 VDC | 2003 | 24VDC from PLC, COM 0, COM 1 |
| IN 0 | - | Not used |
| IN 1 | 2008 | On-load lane #1 product sensor |
| IN 2 | 2038 | On-load lane #2 product sensor |
| IN 3 | 2009 | Oven ready |
| IN 4 | 2018 | Off-load lane #1 product sensor |
| IN 5 | 2048 | Off-load lane #2 product sensor |
| IN 6 | 2014 | Downstream machine lane #1 ready (SX202-1) W189A |
| IN 7 | 2044 | Downstream machine lane #2 ready (SX203-1) W189B |
| IN 8 | - | Not used |
| IN 9 | - | Not used |
| IN 10 | - | Not used |
| IN 11 | - | Not used |
| IN 12 | - | Not used |
| IN 13 | - | Not used |
| COM 0 | 2003 | Input common for IN 0 through IN 3 (24VDC) |
| COM 1 | 2003 | Input common for IN 4 through IN 13 (24VDC) |
| L1 | 18 | 115 VAC hot |
| NEUT | 2 | 115 VAC neutral |
| G | G | Protective ground |
| DC 0 | 2020 | Output common for OUT 0 (SX200-1) W190A |
| OUT 0 | 2022 | Oven ready to upstream lane #1 (SX200-2) W190A |
| DC 1 | 2040 | Output common for OUT 1 (SX201-1) W190B |
| OUT 1 | 2042 | Oven ready to upstream lane #2 (SX201-2) W190B |
| DC 2 | 2021 | Output common for OUT 2 and OUT 3 (SX202-3) W189A |
| OUT 2 | 2023 | Product available to downstream lane #1 (SX202-4) W189A |
| OUT 3 | - | Not used |
| DC 3 | 2051 | Output common for OUT 4 and OUT 5 (SX203-3) W189B |
| OUT 4 | 2053 | Product available to downstream lane #2 (SX203-4) W189B |
| OUT 5 | - | Not used (Always on when PLC is in run mode) |
| DC 4 | - | Output common for OUT 6 through OUT 9 |
| OUT 6 | - | Downstream lane #1 alarm (product jam or not ready) |
| OUT 7 | - | Downstream lane #2 alarm (product jam or not ready) |
| OUT 8 | - | Not used |
| OUT 9 | - | Not used |

PLC SMEMA program logic table

Logic states 1=ON (corresponding led on PLC is active), 2=OFF, X=Don't care

| | | | | | | | | | | | | | | Operation |
|---|------------------------------------|------------------------------------|------------------------|-------------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|---|---|--|--|--------------------------------|---|-----------|
| | IN 1 (2008) On-load lane #1 sensor | IN 2 (2038) On-load lane #2 sensor | IN 3 (2009) oven ready | IN 4 (2018) Off-load lane #1 sensor | IN 5 (2048) Off-load lane #2 sensor | IN 6 (2014) Downstream lane #1 ready | IN 7 (2044) Downstream lane #2 ready | OUT 0 (2022) Oven ready to lane #1 upstream | OUT 1 (2042) Oven ready to lane #2 upstream | OUT 2 (2023) Product available to lane #1 downstream | OUT 4 (2053) Product available to lane #2 downstream | OUT 6 Lane #1 downstream alarm | OUT 7 Lane #2 downstream alarm | |
| 1 | X | 1 | X | X | 1 | X | 1 | X | X | X | 0 | X | Lane #1 Start transfer of product from lane #1 upstream | |
| 1 | X | 1 | X | X | 1 | X | 0 | X | X | X | 0 | X | Lane #1 Oven ready to upstream shuts off during transfer and remains off for additional time based on potentiometer zero setting on PLC for product spacing | |
| X | X | 1 | X | X | 0 | X | 0 | X | X | X | 1 | X | Lane #1 on-load product transfer is suspended after downstream lane #1 ready signal is absent beyond 30 seconds | |
| X | X | X | 1 | X | X | X | X | X | 1 | X | 0 | X | Lane #1 transfer of product to downstream | |
| X | X | X | 1 | X | X | X | 0 | X | 1 | X | 1 | X | Lane #1 product jam alarm occurs after product has been present at the off-load sensor beyond 180 seconds | |
| | | | | | | | | | | | | | | |
| X | 1 | 1 | X | X | X | 1 | X | 1 | X | X | X | 0 | Lane #2 Start transfer of product from lane #2 upstream | |
| X | 1 | 1 | X | X | X | 1 | X | 0 | X | X | X | 0 | Lane #2 Oven ready to upstream shuts off during transfer and remains off for additional time based on potentiometer one setting on PLC for product spacing | |
| X | X | 1 | X | X | X | 0 | X | 0 | X | X | X | 1 | Lane #2 on-load product transfer is suspended after downstream lane #2 ready signal is absent beyond 30 seconds | |
| X | X | X | X | 1 | X | X | X | X | X | 1 | X | 0 | Lane #2 transfer of product to downstream | |
| X | X | X | X | 1 | X | X | X | 0 | X | 1 | X | 1 | Lane #2 product jam alarm occurs after product has been present at the off-load sensor beyond 180 seconds | |



Allen Bradley MicroLogix 1200 Terminal Detail

Procedure for testing the SMEMA Machine Interface on an oven

The SMEMA operation of each lane is independent in the PLC. Each lane can be tested separately or together without effecting the other.

- 1) Allow the oven to get into a process ready state by operating a belt recipe or by installing a jumper wire between the IN 3 and the 24 COM terminal on the PLC. IN 3 on the PLC should be on.

Lane 1 Testing

- 2) Install a mating connector on the off-load connector of the oven with a jumper installed between pins 1 and 2, cable W189A to provide the downstream machine ready signal to the PLC. Or install a jumper wire on the electrical panel on terminal block X30 between wire numbers 2014 and 2007. IN 6 on the PLC should be on.
- 3) Connect the flashlight end of the test equipment to the on-load connector of the oven, cable W190A or install 2 wires in a mating plug connector on pins 1 and 2 and connect the free ends to an external ohm meter or continuity tester.
- 4) OUT 0 on the PLC should be on and the test equipment on the on-load end of the oven should be on to indicate that the oven is ready to accept product from the upstream machine lane 1.
- 5) Turn the top potentiometer (zero) on the PLC fully counter clockwise for minimum product spacing. The potentiometers on the Allen Bradley PLC are located behind a removable access plate on the front lower left of the PLC below the Allen Bradley logo.

The test equipment on the on-load of the oven should follow OUT 0 on the PLC in the following tests.

- 6) Run a test product under the on-load sensor for lane 1 and verify that OUT 0 goes off on the PLC while the product is under the on-load sensor and remains off for an additional second after the on-load sensor is clear.

- 7) Turn the top potentiometer (zero) on the PLC ½ turn clockwise. Run a test product under the on-load sensor for lane #1 and verify that OUT 0 remains off approximately 30 seconds after the on-load sensor is clear.
- 8) Return the top potentiometer (zero) on the PLC to the fully counter-clockwise setting.
- 9) Remove the mating connector on the off-load connector of the oven or the jumper wire that was installed previously in step 2. Verify that after 30 seconds OUT 0 is off on the PLC to indicate that the oven is no longer ready to accept product on lane #1.
- 10) Run a product or object under the off-load sensor for lane #1 and verify that OUT 2 on the PLC comes on and remains on until the off-load sensor is clear to indicate that product is available to a downstream machine.

Lane 2 Testing

1. Install a mating connector on the off-load connector of the oven with a jumper installed between pins 1 and 2, cable W189B to provide the downstream machine ready signal to the PLC. Or install a jumper wire on the electrical panel on terminal block X30 between wire numbers 2044 and 2007. IN 7 on the PLC should be on.
2. Connect the flashlight end of the test equipment to the on-load connector of the oven, cable W190B or install 2 wires in a mating plug connector on pins 1 and 2 and connect the free ends to an external ohm meter or continuity tester.
3. OUT 1 on the PLC should be on and the test equipment on the on-load end of the oven should be on to indicate that the oven is ready to accept product from the upstream machine lane 2.
4. Turn the bottom potentiometer (one) on the PLC fully counter clockwise for minimum product spacing. The potentiometers on the Allen Bradley PLC are located behind a removable access plate on the front lower left of the PLC below the Allen Bradley logo.
5. The test equipment on the on-load of the oven should follow OUT 1 on the PLC in the following tests.
6. Run a test product under the on-load sensor for lane 2 and verify that OUT 1 goes off on the PLC while the product is under the on-load sensor and remains off for an additional second after the on-load sensor is clear.
7. Turn the bottom potentiometer (one) on the PLC ½ turn clockwise. Run a test product under the on-load sensor for lane #2 and verify that OUT 1 remains off approximately 30 seconds after the on-load sensor is clear.
8. Return the bottom potentiometer (one) on the PLC to the fully counter-clockwise setting.
9. Remove the mating connector on the off-load connector of the oven or the jumper wire that was installed previously in step 2. Verify that after 30 seconds OUT 1 is off on the PLC to indicate that the oven is no longer ready to accept product on lane #2.
10. Run a product or object under the off-load sensor for lane #2 and verify that OUT 4 on the PLC comes on and remains on until the off-load sensor is clear to indicate that product is available to a downstream machine.

End of on oven test.

Notes:

When the flashlight for the on-load end is on, the oven is ready to accept product. The flashlight will come on if:

1. The oven is process ready,
2. There is no product under the on-load sensor,
3. The downstream machine is ready, and
4. No downstream alarm conditions have been detected by the PLC.

A downstream alarm condition is indicated by OUT 6 for lane 1 and OUT 7 for lane 2.

The SMEMA interface for each of the two lanes operates independently through shared inputs on the PLC. The second lane can be left unconnected on an oven with only one lane of SMEMA interface.

If the PLC does not comply with any of the test conditions, then it needs to be reprogrammed or replaced.

Procedure for Stand-alone SMEMA Machine Interface Test

Required Equipment:

Pre-programmed PLC - Vitronics Soltec part number 1476902

3 wire "cheater cord" - power cord with stripped back wires on one end and a plug for a 115 Volt outlet on the other

10 jumper wires (24 to 16 AWG) each approximately 4 inches long.

Small screwdriver (flat or phillips) for adjusting the trim potentiometers.

The SMEMA operation of each lane is independent in the PLC. Each lane can be tested separately or together without effecting the other.

- 1) Connect the following jumper wires: From 24VDC to COM 0 and to COM 1 terminals on the PLC. From 24 COM to I 3 to I 6 and then to I 7 on the PLC. Connect one additional test wire on the PLC from the 24 COM terminal and leave the other end unconnected (not touching anything).
- 2) Connect the 3 wire cheater cord to the power terminals: green or green/yellow to the protective earth ground, white or light blue to neutral (NEUT), and the remaining wire (typically red, black, or brown) to the "hot" or "line" terminal (L1).
- 3) Plug the cheater cord into a standard 115 Volt outlet. The lights on the PLC should flash for a few seconds, while the PLC is running self-diagnostics. The "power" and "run" lights on the front of the PLC should remain on.

Lane 1 Testing

- 4) OUT 0 on the PLC should be on to indicate that the oven is ready to accept product from the upstream machine lane 1.
- 5) Turn the top potentiometer (zero) on the PLC fully counter clockwise for minimum product spacing. The potentiometers on the Allen Bradley PLC are located behind a removable access plate on the front lower left of the PLC below the Allen Bradley logo.
- 6) Touch and hold the free end of the test wire to the IN 1 terminal on the PLC. Verify that OUT 0 goes off on the PLC while the test wire is connected to IN 1 and remains off for an additional second after the test wire is moved off of the IN 1 terminal.
- 7) Turn the top potentiometer (zero) on the PLC ½ turn clockwise. Touch and hold the free end of the test wire to the IN 1 terminal on the PLC. Verify that OUT 0 remains off approximately 30 seconds after the test wire is moved off of the IN 1 terminal.
- 8) Return the top potentiometer (zero) on the PLC to the fully counter-clockwise setting.
- 9) Temporarily disconnect the wire(s) connected to terminal I 6 on the PLC. Verify that after 30 seconds OUT 0 is off on the PLC to indicate that the oven is no longer ready to accept product on lane #1.
- 10) Touch and hold the free end of the test wire to terminal I 4 on the PLC and verify that OUT 2 on the PLC comes on and remains on until the test wire is removed to indicate that product is available to a downstream machine.

Lane 2 Testing

1. OUT 1 on the PLC should be on to indicate that the oven is ready to accept product from the upstream machine lane 2.
2. Turn the bottom potentiometer (one) on the PLC fully counter clockwise for minimum product spacing. The potentiometers on the Allen Bradley PLC are located behind a removable access plate on the front lower left of the PLC below the Allen Bradley logo.
3. Touch and hold the free end of the test wire to the IN 2 terminal on the PLC. Verify that OUT 1 goes off on the PLC while the test wire is connected to IN 2 and remains off for an additional second after the test wire is moved off of the IN 2 terminal.

4. Turn the bottom potentiometer (one) on the PLC ½ turn clockwise. Touch and hold the free end of the test wire to the IN 2 terminal on the PLC. Verify that OUT 1 remains off approximately 30 seconds after the test wire is moved off of the IN 2 terminal.
5. Return the bottom potentiometer (one) on the PLC to the fully counter-clockwise setting.
6. Temporarily disconnect the wire(s) connected to terminal I 7 on the PLC. Verify that after 30 seconds OUT 1 is off on the PLC to indicate that the oven is no longer ready to accept product on lane #2.
7. Touch and hold the free end of the test wire to terminal I 5 on the PLC and verify that OUT 4 on the PLC comes on and remains on until the test wire is removed to indicate that product is available to a downstream machine.
8. Unplug the cheater cord and remove all of the connections to the PLC. Lightly tighten all the screws before returning the unit to its box.

End of stand-alone test.