

## **FlexXpand**

### **Siemens FX2 series**

#### **Material Conveying System Controls**

**FX2-516-10-7C, FX2-516-10-12C**  
**FX2-532-25-7C, FX2-516-25-12C**  
**Including NovaNet® Option**



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Novatec, Inc. 222 E. Thomas Ave. Baltimore, MD 21225 | [www.novatec.com](http://www.novatec.com)

Phone: 410-789-4811  
Toll Free: 800-938-6682  
Main Fax: 410-789-4638

Parts Email: [parts@novatec.com](mailto:parts@novatec.com)  
Service Email: [service@novatec.com](mailto:service@novatec.com)  
Sales Email: [sales@novatec.com](mailto:sales@novatec.com)

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Instruction Manual: FX2 IM 26 FEB 2018

Model #: \_\_\_\_\_

Serial # \_\_\_\_\_

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## 1.0 PURPOSE OF THIS MANUAL

This manual describes the installation and operation of Novatec's FX2 Series Material Conveying System controller. Before installing this product, please read this guide and any additional guides associated with the system's auxiliary equipment.

### 1.1 Explanation of Symbols

This manual includes both general and task-specific safety precautions. These precautions are highlighted in the manual by the following categories:



**WARNING:** This symbol identifies situations that are potentially hazardous to personnel or equipment.

---

#### **NOTE**

Highlights information provided in text or procedures. This information may or may not be related to safety.

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## 2.0 SAFETY PRECAUTIONS AND WARNINGS

These operating instructions must be read, understood, and implemented by all personnel responsible for this system.

- ❑ All mechanical and electrical work must be performed by qualified personnel only.
- ❑ Always disconnect power before servicing.
- ❑ Refer to the machine nameplate and drawings supplied with this system for actual power requirements.
- ❑ Be sure to install the equipment in the proper electrical area according to the NEMA rating specified. Care must be taken to adhere to all national and local regulations.
- ❑ Electric power supply should be through a separate disconnect switch with properly sized overload/fuse protection.
- ❑ Thread protectors and caps provided on solenoid valves, traps, pipe ends, etc. must be removed prior to start-up.
- ❑ The customer is required to operate the equipment with all safety features in proper working condition.
- ❑ Novatec shall provide no further guarantee for function and safety in the event of unauthorized modifications.

### 3.0 GENERAL DESCRIPTION

The Novatec FX2 Series controller is a custom-programmed PLC-based control system designed to incorporate existing and future equipment.

The FlexXpand FX2 series is a PLC based, centrally installed touchscreen loading control featuring intuitive operation with the ability to expand using economical FlexXpand modules.

Low cost installation is assured with the use of expansion modules that connect to the main control with a simple ProfiNet Communications Cable and Expansion Modules can be conveniently located to minimize wiring to system components. No extra programming is required as FlexXpand modules are enabled through the FX2 HMI interface.

A choice of two touch screen sizes and two different control capabilities are available. All models may be fully expanded with FlexXpand modules.

The FX2 allows easy expansion without the need for additional programming. Vivid icons show functions and enhance control understanding. Installation cost is minimized by the ability to place FlexXpand modules throughout the operation, minimizing cable runs.

Blow Back and Proportioning may be optioned in the main control and in FlexXpand modules.

There is a piezo alarm horn on control face, plus a red alarm light on alarm silence pushbutton.

All FX2 controls are equipped with Ethernet capability so they may be readily networked to PC(s) anywhere. In addition, the FX2 may be programmed to send alarm email messages to any SMTP server. **PLEASE CONSULT FACTORY ABOUT SETUP.**

### 4.0 SPECIFICATIONS

#### System Component Capabilities

Component	Panel Input Voltage	Description	Pumps	Receivers	Purge Valves or Blowback	Proofing Lines
FX2-516-10-7C	115/230 VAC	7" Diag. color touch screen PLC	5	16	10	0
FX2-516-10-12C	115/230 VAC	12" Diag. color touch screen PLC	5	16	10	0
FX2-532-25-7C	115/230 VAC	7 " Diag. color touch screen PLC	5	32	25	0
FX2-532-25-12C	115/230 VAC	12" Diag. color touch screen PLC	5	32	25	0

### Specifications:

Component	Dimensions W x H x D		Amps Required		I/O Voltage
	in	mm	115V	230V	
FX2-516 & FX2-532	30 x 24 x 8	762 x 610 x 203	6	3	24 VDC
FX2-516 & FX2-532	36 x 36 x 8	914 x 914 x 203	6	3	115 VAC
FXM2-STA	18 x 18 x 8	457 x 457 x 203	3	1.5	24 VDC or 115 VAC
FXM2-PUMP	18 x 18 x 8	457 x 457 x 203	3	1.5	
FXM2-MSV	18 x 18 x 8	457 x 457 x 203	3	1.5	
FXM2-ID/STA	18 x 18 x 8	457 x 457 x 203	3	1.5	24 VDC ONLY
FXM2-ID/ MSV32&16	18 x 18 x 8	457 x 457 x 203	3	1.5	

Note: add -12 to FX2 models and FXM2 modules for 115 VAC inputs/outputs (Where available)

See FX2-NovaNet Control to include other system components like, dryers, blenders, silos, railcar unloaders, etc.

### Options:

**Blowback and proportioning output cards for up to 16 receivers:** Up to 4 cards (2 each of proportioning and blowback) can be factory installed and wired into FX2 control. For 24 VDC or 115 VAC.

**Ethernet Switch, 5-port:** Adds networking ports to main panel and RHI'S 115 V I/O for existing systems

**230 V Panel Input Power:** All models, 24 VDC I/O only.

**Alarm strobe:** (must match panel I/O voltage)

For 24 VDC  
or 115 VAC.

### Accessories:

**Receiver Xpand Module:** Up to 8 may be added. 16 Inputs / 16 Outputs expansion panel for 16 receivers. (add optional outputs for using blowback and/or proportioning with receivers).

**Pump Xpand Module:** Up to 3 may be added. 8 Inputs / 16 Outputs expansion panel for 5 pumps (add optional output for using automatic backup valves - backup pump required).

**Purge Valve Xpand Module:** Up to 3 may be added for material sources. 0 Inputs / 16 Outputs expansion panel for 16 purge valves.

**Auto ID: (source) Xpand Module:** Up to 4 may be added. 32 or 16 Inputs / 0 Outputs expansion panel for 32 or 16 Auto ID sources 24 VDC outputs only

**Auto ID: (destination) Xpand Module:** Up to 5 may be added. 0 Inputs / 32 Outputs expansion panel for 32 Auto ID destinations 24 VDC inputs only

### Ethernet Communication Cable

#### Ethernet Cable Connector

**Ethernet Repeater Switch:** 5 port or 8 port – Stand alone installation 115 VAC input power required. (Required to extend a single network cable segment greater than 300 feet).

**Cables For Receivers:** 18/6 or 16/6 with drain wire and PVC jacket.

**Remote Touch-Screen HMI:** (12" color) Extending Ethernet through an RHI panel requires (optional) Ethernet switch.



## 5.0 PLC OVERVIEW

### 5.1 General

The FlexXpand Series Material Conveying System Controller utilizes a centrally mounted PLC that sends commands to various conveying system components.

### Startup and Power Loss

When power is first applied to the PLC following a power loss, the system will automatically start loading enabled stations that have material demand if the AUTO START ON POWER UP mode has been selected. If a Loading Station or Vacuum Pump is enabled, as indicated by ON, it will remain enabled. This prevents the operator from having to restart each piece of equipment. When first starting up, each station will have to be configured with the proper vacuum pump assignment, load, fill and dump times, no load alarm cycles, material number, and be enabled.

The System Setup page has the button defining the power up mode:

## 6.0 OPERATING PRINCIPLES

### 6.1 FlexXpand Conveying Controller

The program controls the operation of loading the receivers from selected sources. The FlexXpand controls the operation of the Vacuum Pumps (VP), the station “Tee” valves and the Purge (Source) valves. The FlexXpand must be in SYSTEM RUNNING mode for any conveying to take place. The FlexXpand will not default to STOPPED mode on power loss. Starting or stopping the FlexXpand will not reset the various station settings and controls.

(Green icon – see Setup Screen 2)



### 6.2 Vacuum Pump (VP)

Each VP is hard piped to multiple stations. Stations may be assigned to any VP.



**CAUTION:** Care must be taken to verify that the mechanical connection of a station valve to a VP matches the VP assignment of that particular station

A VP will start when an associated loading station calls for material. The VP will run for the LOAD and PURGE portions of a fill cycle, plus a settable SEEK time. If no other station calls for material, the VP will shut down after the seek time expires. A new station calling for material will reset the seek timer and begin a new fill cycle. The seek timer is accessible from the HMI display's Vacuum Pump Setup page and has a default value of 180 seconds.

### 6.3 Receiver Station

Each molding machine/press or drying bin hopper is equipped with a Vacuum Receiver complete with level switch. The FlexXpand control panel allows the user to view the status of the receiver, enable or disable it, and view or change any setup parameter. Enabling of a receiver permits it to be automatically serviced by the conveying panel. A receiver may be enabled or disabled at any time. If a receiver is in a fill cycle when it is disabled, the cycle will continue to completion. Receiver Station status indications are:

- ❑ OFF – The Receiver is Disabled.
- ❑ ENABLED – The Receiver enabled, not in the fill cycle and the level switch is satisfied.
- ❑ DEMAND – The Receiver is not in the fill cycle and the level switch calls for material.
- ❑ REGRIND – The Receiver is in the loading regrind material portion of the fill cycle. The station Tee valve is open and the proportioning valve is energized to draw regrind material.
- ❑ VIRGIN – The Receiver is in the loading virgin material portion of the fill cycle. The station Tee valve is open and the material source valve is energized open permitting material to be conveyed to the vacuum chamber.
- ❑ PURGE – The Receiver is in purge portion of the fill cycle. The station Tee valve is open and the material source valve is closed allowing the conveying line to be purged free of any remaining material.
- ❑ DUMP – The Receiver is in the dump portion of the fill cycle. The Station TEE valve closes, removing vacuum from the hopper. The material conveyed into the hopper gravity conveys (dumps) into the molding machine or drying bin.
- ❑ ALARM – The receiver has gone through the fill cycle, without satisfying the material level prox sensor, a consecutive number of times equal to or greater than the no load alarm set point.

#### 6.3.1 Receiver Fill Cycle

The Receiver Station number is moved into the appropriate Vacuum Pump FIFO queue when the receiver has material demand. The default VP assignment for all receiver stations is number 1. The fill cycle consists of three states, LOAD, PURGE and DUMP. When the receiver is ready to be serviced, the Vacuum Pump will start, if not already running, and the station Tee valve will open at the start of the fill cycle. The material source valve opens allowing pellets to be conveyed from the source to the vacuum chamber. The station Tee valve will remain open for the load and purge times.

When the load time expires, the material source valve closes and the purge time begins. The purge time allows any pellets in the conveying line to be carried into the JIT chamber. When the purge timer expires the station Tee valve is closed and the dump timer is started. The Vacuum Pump FIFO stack advances to service the next station at the end of the purge time. Any pellets in the vacuum chamber will be gravity conveyed into the press hopper.

If the material level switch is not satisfied at the end of the dump time, the receiver will be placed back at the end of its Vacuum Pump FIFO queue. The load, purge, and dump set points are changeable from the HMI and have default values of 10, 10, and 5 seconds respectively.

### 6.3.2 VP FIFO Queue

Each Vacuum Pump has a First In/First Out (FIFO) queue. Any station Receiver may be assigned to any Vacuum Pump. The queue contains the receiver numbers (1 to 120) in the order the receivers became empty and needed material. The VP services each station in the order in which the demand was generated. A station is removed from the queue at the end of the purge cycle. At this time the VP begins to service the next station in the queue, if any. A station is still in demand at the end of the dump cycle will be reentered into the queue. If there are no other stations in the queue, the fill cycle will repeat as soon as the dump cycle is complete.

### 6.3.3 Receiver Station Alarms

Each station receiver has a No Load fault. If the receiver has gone through the fill cycle, without satisfying the material level prox sensor, a consecutive number of times equal to or greater than the no load alarm set point, the alarm flag is set. The alarm will be cleared when the demand is satisfied or the station is disabled. The number of cycles is field changeable through the HMI, with the default value set at 3. Entering a value of zero (0) will disable the alarm. A station will continue to load even if the alarm is on.

### 6.3.4 Vacuum Pump Alarms

The Vacuum Pumps have motor failure alarms. The motor failure alarm is set whenever the motor is called to run, but the motor auxiliary contact input is not made after 3 seconds. The alarm can only be cleared by pressing the "ALARM SILENCE" button on the front of the controller. Once a vacuum pump is in an alarm state, the controller will not allow that vacuum pump to attempt to convey until the alarm is cleared.

## 7.0 CONTROL EXPANSION

### 7.1 FlexXpand FX2 Main Panel and FXM2 Module Addressing

The Expansion Modules are configurable with memory cards or with appropriate Siemens software, and each need the appropriate Profinet Name uploaded to match the expansion module for the desired devices.



Station No	Profinet Station Name	IP Address	Remote IO Type
Main	pn-io	192.168.1.8	-
100	o532oMachine	192.168.1.100	-
1	Expand Sta 33-48	192.168.1.101	FXM2-STa
2	Expand Sta 49-64	192.168.1.102	FXM2-STa
3	Expand Sta 65-80	192.168.1.103	FXM2-STa
4	Expand Sta 81-96	192.168.1.104	FXM2-STa
5	Expand Sta 97-112	192.168.1.105	FXM2-STa
6	Expand Sta 113-128	192.168.1.106	FXM2-STa
7	Expand Sta 129-144	192.168.1.107	FXM2-STa
8	Expand Sta 145-160	192.168.1.108	FXM2-STa
9	Expand Vac Pump 6-10	192.168.1.109	FXM2-PUMP
10	Expand Vac Pump 11-15	192.168.1.110	FXM2-PUMP
11	Expand Vac Pump 16-20	192.168.1.111	FXM2-PUMP
12	Expand Mat SV 26-41	192.168.1.112	FXM2-MSV
13	Expand Mat SV 42-57	192.168.1.113	FXM2-MSV
14	Expand Mat SV 58-73	192.168.1.114	FXM2-MSV
15	Expand ID Out Sta 1-32	192.168.1.115	FXM2-ID/STa
16	Expand ID Out Sta 32-64	192.168.1.116	FXM2-ID/STa
17	Expand ID Out Sta 65-96	192.168.1.117	FXM2-ID/STa
18	Expand ID Out Sta 97-128	192.168.1.118	FXM2-ID/STa
19	Expand ID Out Sta 129-160	192.168.1.119	FXM2-ID/STa

Table continued on next page.

Table continued from last page.

Station No	Profinet Station Name	IP Address	Remote IO Type
20	Expand ID In Mat 1-32	192.168.1.120	FXM2-ID/MSV32
21	Expand ID In Mat 33-48	192.168.1.121	FXM2-ID/MSV16
22	Expand ID In Mat 49-64	192.168.1.122	FXM2-ID/MSV16
23	Expand ID In Mat 65-73	192.168.1.123	FXM2-ID/MSV16
24	Silo 1-4	192.168.1.124	FXM2-SILO1-4
25	Silo 5-8	192.168.1.125	FXM2-SILO5-8
26	Silo9-12	192.168.1.126	FXM2-SILO9-12
27	ePBPN1 lu10 gateway <i>NOTE: for silos 1-10</i>	192.168.1.127	ePBPN
28	ePBPN2 lu2 gateway <i>NOTE: for silos 11-12</i>	192.168.1.128	ePBPN

## 7.2 FlexXpand HMI Interface Addressing

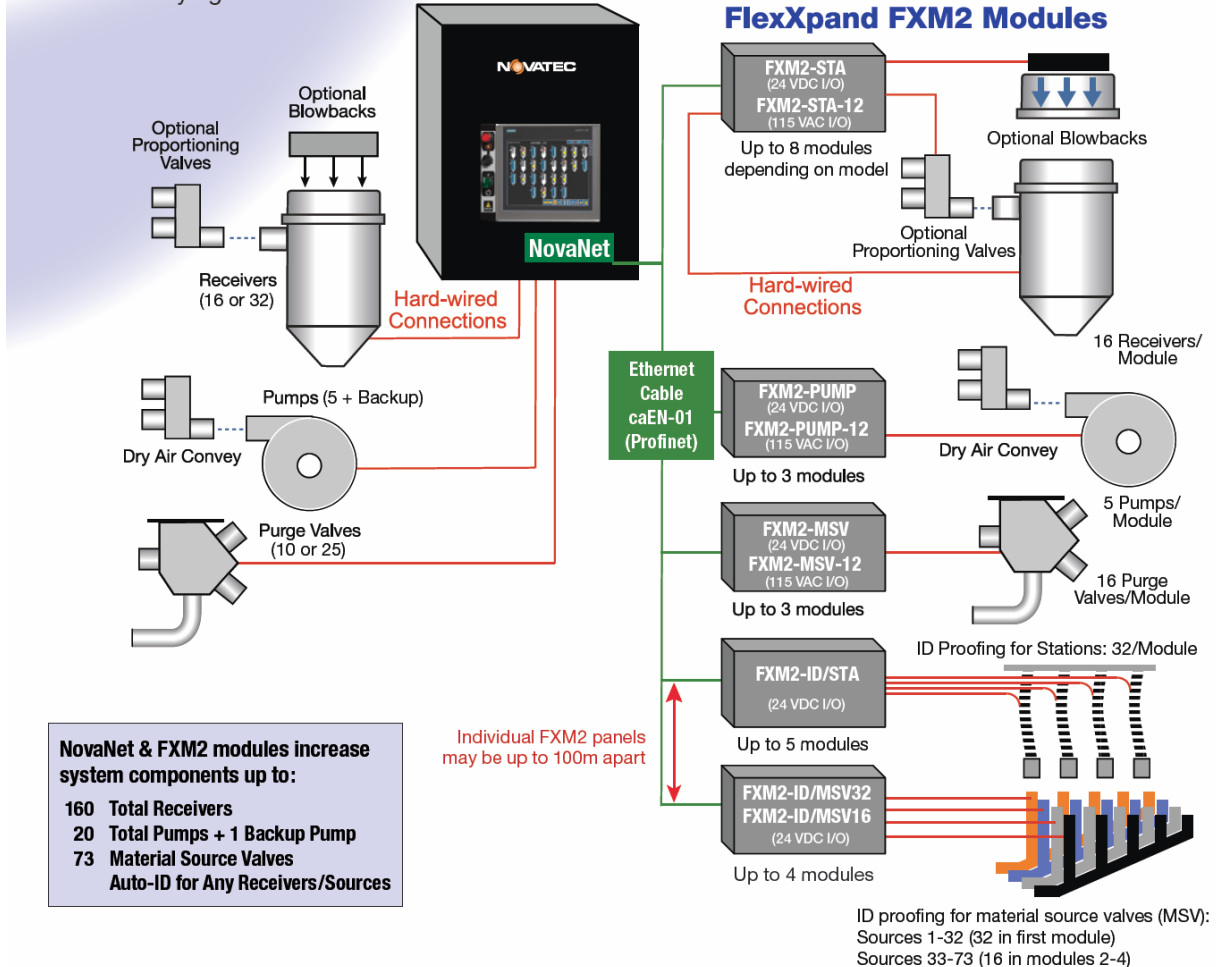
The control system HMI touchscreens (local and remote) are field configurable with appropriate Siemens software, and each needs the appropriate IP address uploaded to match the desired network map.

Station No	IP Address
HMI Main (7 inch)	192.168.1.7
HMI Main (12 inch)	192.168.1.9
RHI 1 (12 inch)	192.168.1.12
RHI 2 (12 inch)	192.168.1.13
RHI 3 (12 inch)	192.168.1.14
RHI 4 (12 inch)	192.168.1.15

### 7.3 Typical Wiring / Network Topology and Options

## FlexXpand FX2 with FlexXpand FXM2 Modules

The full-featured FlexXpand FX2 provides detailed control and monitoring of these conveying devices:



See FX2-NovaNet Control to include other system components like, dryers, blenders, silos, railcar unloaders, etc.

**Receivers:** Load time, discharge time, *proportioning*<sup>①</sup> percentage, number of layers, blowback pulses, priority selection (standard and high), failed fill alarm. Receiver demands are serviced in the order they are received (FIFO). Purge time, open or closed loop conveying.

**Pumps:** Pump "ON" (starter), overload alarm, vacuum breaker valve function (NO or NC) and timer, dry air conveying closed loop valve, and run-time clock.

**Purge Valves:** Assign valves to any receiver and manifold *sharing capability*<sup>②</sup> (allows multiple pumps to work with common valves).

**Material Sources and Destinations:** Optional Auto ID<sup>③</sup> material source to receiver destination proofing prevents conveying through mismatched manifold connections.

<sup>①</sup> Proportioning can be added as an option to the main FX2 panel and the Xpand FX2-STA panels in groups of 16 consecutive stations. Blowback can be added as a separate option in a similar manner.

<sup>②</sup> Novatec's unique manifold sharing capability provides 'traffic control' of multiple pump systems calling upon the same shared material source. The FX2 assigns the source to one pump and allows waiting pump(s) to continue loading other receivers until the source is available. The FX2 remembers 'skipped' receivers and ensures a limited wait time.

<sup>③</sup> Auto ID confirms the selected material source for each 'proofed' station matches the physical hose connection at the source selection manifold. If the correct connection is not confirmed through the (optional) manifold proofing connections, an alarm is generated and loading is not permitted.

## 8.0 INSTALLATION

After unpacking and inspecting the FlexXpand Controller, four basic activities will be performed. These activities are:

1. Completely install stations and station valves, pumps, and other mechanical components. Run material conveying lines.
2. Locate and mount the electrical controls for the main base unit, pumps, dryers, etc.
3. Install the remote FlexXpand node panels and run communication wiring. Wire the equipment to the node blocks per the wiring diagram.
4. Assign addresses to pumps and stations.

All national and local electrical, building, and safety codes need to be followed. Proper grounding of all equipment is important. Check the electrical wiring schematic for wiring numbers and details. The following paragraphs describe installation of typical system components. Some of them are optional and may not be required for your system.

**CAUTION:** The conveying lines must be grounded to prevent "shocks" from static electricity that are generated by some materials as they are conveyed. This is an extremely important step.



All electronics are susceptible (to varying degrees) to electrostatic damage and, although as much protection as possible has been designed into the system, this cannot completely eliminate upsets due to electrostatic voltage being accidentally introduced into the electronic circuitry.

Generally, grounding the case of the container from which the material is being conveyed (including the lines) to the same potential as the green wire ground of the conveying system eliminates most of this problem.

## 8.1 Mechanical Installation

### 8.1.1 Material Conveying Lines

The single most important activity performed to ensure satisfactory operation of a pneumatic conveying system is the actual installation of the equipment. All components should be located so that material lines and vacuum lines are as short as possible. Elbows or other changes in direction should be minimized. The material conveying line should be horizontal and/or vertical and as direct as possible with no slope. Care needs to be taken that all connectors are vacuum tight. All rigid conveying tubing should be properly supported by the customer to provide a safe and secure installation.

It is generally recommended to use flexible hose and clamps to connect material pick up lances, vacuum chambers, etc. to material or vacuum lines. The flexible hose should only be as long as needed since excess hose will reduce the efficiency of the system. The hose should not sag.

Rigid tubes and elbows should be connected together with bolted couplers. Each tube end should be square cut, round, and without burrs. The tube ends should butt together when installed, with the bolted coupler centered over the joint.

### 8.1.2 Vacuum Pump

Locate the vacuum pump so that access to the secondary filter element mounted to the unit is available. Secure to the floor or platform as necessary. Attach high voltage (check nameplate) to the motor starter located in the motor starter junction box mounted to the vacuum power unit FROM A FIELD-SUPPLIED DISCONNECT SWITCH or to the optional combination starter with integral fused disconnect switch. An electrical ground wire is also required. Control wiring for the starter coil and auxiliary feedback will need to be wired back to the control cabinet

A clean, dry supply of 80 -120 PSIG compressed air must be connected to the pressure port on the vacuum breaker valve solenoid valve. When the vacuum breaker valve is energized, it allows ambient air to pass through the vacuum blower. This is done instead of shutting the pump down to prevent premature wearing of the pump and belt drive caused by constantly starting and stopping the pump. Eventually the pump will shut down completely (if not needed) when the seek timer expires. Note that the default time programmed into the seek timer of the system is 120 seconds when the system is first shipped to you. If the pump seems to be shutting down after an usually short or long period, check the programmed search timer value.



VPDB



VRB



### 8.1.3 Cyclone Filter

Locate the cyclone filter as close as possible to the vacuum power unit. Provide access for the material catch pan or fines drum as necessary. Secure the cyclone filter to the floor. Attach vacuum lines from the conveying system to the cyclone inlet (tangential inlet on the side of the cyclone body). Attach the cyclone outlet (top duct) to the vacuum breaker valve inlet on the vacuum power unit.



### 8.1.4 Station Valves (Remote Vacuum Sequencing)

Station Valves are remotely installed vacuum sequencing valves. Check the receiver to confirm if a vacuum valve is included, or if a Station Valve is required. Locate near each station's vacuum chamber. Typically, the station valve is rigidly attached with bolted couplers to the cyclone filter vacuum lines while running rigid tube or flex hose to the lid of the vacuum chamber. The station valve solenoid is wired back to the control cabinet. Ground the system as necessary. A clean, dry supply of 80 - 120 PSIG compressed air is connected to the pressure port on the station valve's solenoid valve.



### 8.1.5 Vacuum Receivers

Secure the receiver (VR) to the hopper or surge bin as required. Orient the material inlet line and vacuum outlet line as required. Flex hose is normally used to connect the vacuum receiver body to the supply line, and lid to the vacuum line (or remote Station Valve if equipped). Wire the material level switch (and integral vacuum valve if equipped) back to the control cabinet. A machine mount receiver (MM) is used to dump material directly into the machine throat.



Vacuum Receiver  
(VR)



Machine Mount  
Receiver  
(VR-MM)



Vacuum Receiver  
with built-in  
sequencing valve  
(VRH)

### 8.1.6 Compressed-Air Blow Back

Some vacuum chambers (single and dual inlet) are provided with a compressed air Blow Back solenoid valve for cleaning the filter depending on the application. The pulse Blow Back solenoid valve is wired to the DeviceNet network. A clean, dry supply of 80 -120 PSIG compressed air is required. Connect it to either the compressed air accumulator tank supplied on large vacuum chambers or directly to the pulse Blow Back solenoid valve that is supplied on small vacuum chambers.



### 8.1.7 Purge Valves

Purge valves are typically installed at material sources, like silos, drying hoppers, blender bins, or anywhere conveying lines must be emptied between load cycles.

Two styles are offered by NOVATEC: A dual inlet/single outlet style (below-left) designed to be installed within a tubing network. And a hopper-bottom model (below-right) designed to be installed below drying hoppers. A clean, dry supply of 80 - 100 PSIG compressed air is required for either model. The solenoid valve located on the body of the purge valve must be wired back to the control cabinet.



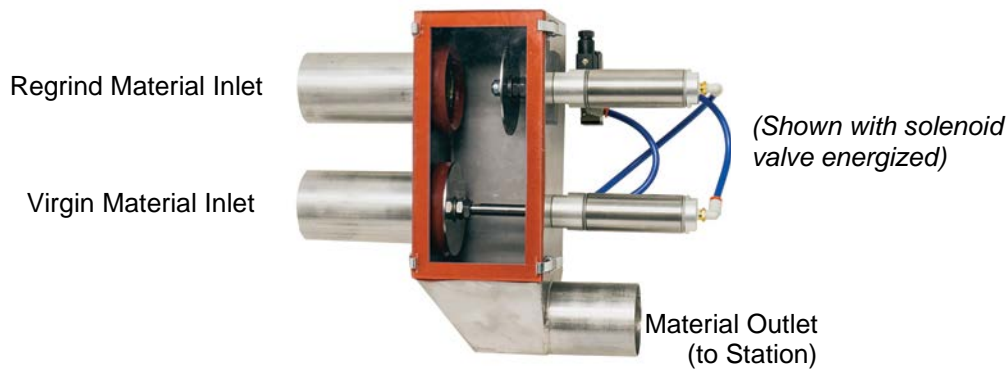
External Purge Valve  
shown with filter  
screen installed



Vacuum Purge  
Takeoff Valve

### 8.1.8 Proportioning Valves

Proportional valves are typically installed directly on or very near individual receivers and allow the entry of locally generated regrind intermittently with virgin material during vacuum loading. A clean, dry supply of 80 - 100 PSIG compressed air is required. The solenoid valve located on the body of the purge valve must be wired back to the control cabinet.



**NOTE:** The control energizes the proportioning valve's solenoid to pull regrind into the receiver station. When installing, please configure the valve's air piping to ensure the top port is closed to regrind in the de-energized state, and opens in the energized state. **IMPORTANT:** Premature gasket wear and failure may occur if the proportioning valve operates with the Regrind Material Inlet on the lower inlet port.

## 8.2 Electrical Installation - General

Always disconnect and lock out the main power supply before wiring power and communication cables between the FlexXpand controller and the network devices and control wiring to external devices. Refer to the wiring diagram and general arrangement drawings supplied with this system before making electrical connections.

- ❑ Use shielded cable for communications wiring.
- ❑ Maximum distance between any two network panels is 100 meters.
- ❑ Keep communication cables and control wiring as far as possible from high voltage equipment. Do not install panel beside power transformer.
- ❑ Avoid running communication cable across power lines. If you must run cable across power lines, run the cable at right angles to the line.
- ❑ Ensure the equipment grounding is properly connected. Shielded cable should be grounded at one end only and is typically grounded in the main I/O enclosure.

**WARNING:** Do not install communication cable where it will come into contact with any buildup of electrical charge!



It may be tempting to run the wire next to the material conveying lines, but a substantial buildup of electrical charge can and will occur, especially with certain types of plastic resins and, if the conveying lines are not grounded, can arc to the cable disrupting communications and/or possibly causing damage.

## 8.3 Electrical Installation – Wires

### 8.3.1 Wire Types

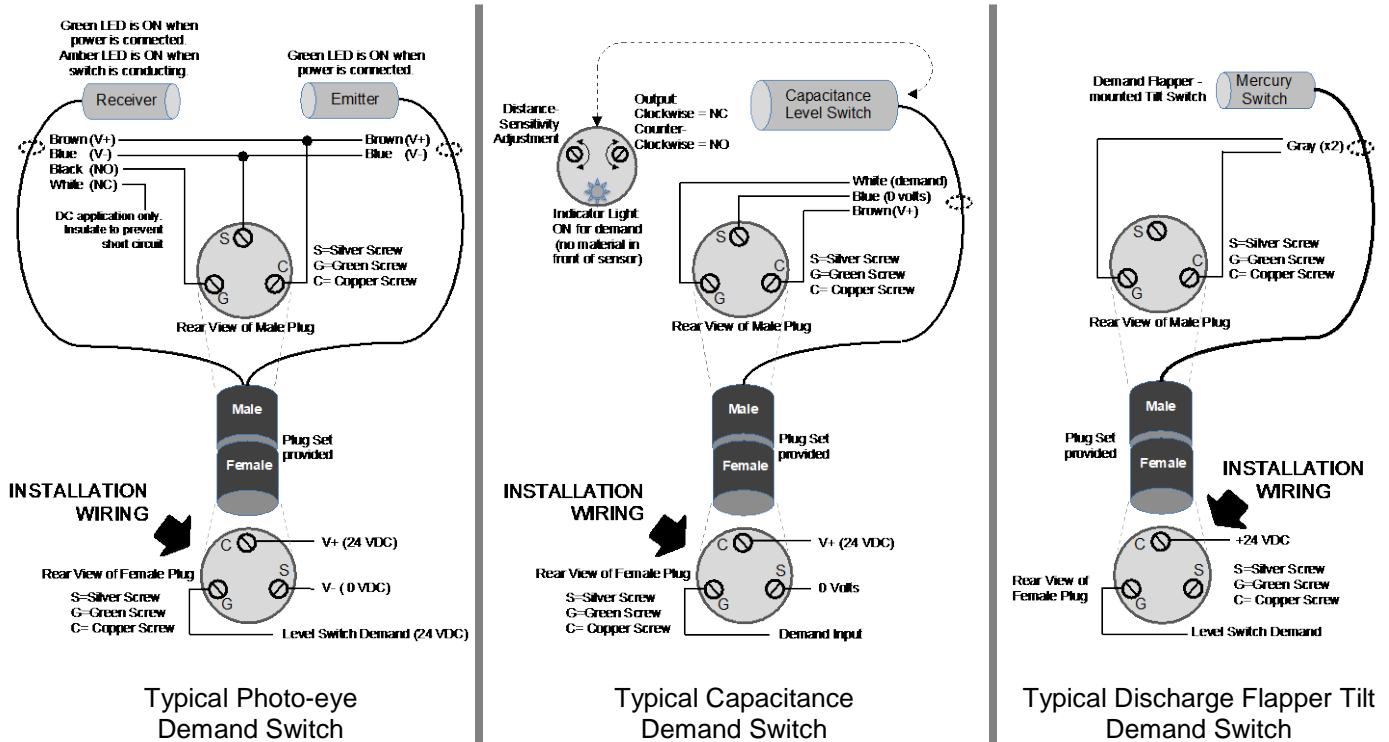
- Blue THHN 16 AWG (18AWG can be used for short distances, 250 feet or less)
- US Electric Code indicates Blue for 24VDC. The gauge designation may be oversized for actual load, and there are percent reductions in AWG needed based on the number of conductors in the conduit; however, many electricians pull 16 AWG as a minimum. Consult with local electrical contractors to confirm local code requirements.

### 8.3.2 Standard Wires for Receivers

- CONTROL POWER (+24VDC) – Supplied from a common terminal (set) at the main panel and shared by receivers grouped with the adjacent power module (see Electrical Schematic).
- CONTROL NEUTRAL (0VDC) – Supplied from a common terminal (set) at the main panel and shared by receivers grouped with the adjacent power module (see Electrical Schematic).
- VACUUM VALVE OUTPUT (unique to each receiver) – The vacuum valve output wire for each station is connected to one side of the receiver's vacuum valve solenoid. This can be either a receiver mounted external fill valve (EFV) or remote mounted station tee valve (SV). The solenoid valve is also wired to the 0VDC common to complete the power circuit when the output is energized.

### 8.3.2 – Standard Wires for Receivers (cont.'d)

- **DEMAND INPUT** (unique to each receiver) – The demand input wire for each station is connected to one side of the receiver's demand switch. The +24VDC common wire is connected to the other side of the demand switch to provide the input signal voltage when the switch closes.



### 8.3.3 Optional Wires for Receivers

(may be required for receiver installed options)

- **BLOWBACK SOLENOID OUTPUT** – Any receiver that includes the blowback option will also require the optional blowback output wire to operate the blowback solenoid valve.
- **PROPORTIONING VALVE SOLENOID OUTPUT** – Any receiver that includes a proportioning (ratio) valve will also require the standard proportioning output wire to operate the proportioning valve solenoid.
- **PURGE VALVE OUTPUT** – Any receiver with a purge valve mounted below the hopper to which it supplies material can also provide the standard purge valve output wire to operate the purge valve solenoid.
- **FOR ALL OF THESE OPTIONS**, the solenoid is also wire to the 0VDC common the complete the power circuit when the output is energized.

### 8.3.4 Standard Wires for Vacuum Pumps

- CONTROL POWER (+24VDC) – Supplied from a common terminal (set) at the main panel and shared by pumps grouped with the adjacent power module (see Electrical Schematic).
- CONTROL NEUTRAL (0VDC) – Supplied from a common terminal (set) at the main panel and shared by pumps grouped with the adjacent power module (see Electrical Schematic).
- AUX CONTACT (unique to each pump) – The Aux Contact input wire for each pump is connected to one side of the pump starter auxiliary contact. The +24VDC common wire is connected to the other side of the auxiliary contact to provide the input signal voltage when the contact closes.
- VACUUM PUMP MS OUTPUT (unique to each pump) – The pump starter output wire for each pump is connected to one side of the pump's motor starter. The motor starter is also wired to the 0VDC common to complete the power circuit when the output is energized.
- VACUUM BREAKER VALVE OUTPUT (unique to each pump) – The vacuum valve output wire for each pump is connected to one side of the pump's vacuum breaker valve solenoid. The solenoid valve is also wired to the 0VDC common to complete the power circuit when the output is energized.

### 8.3.5 Optional Wires for Vacuum Pumps

*(may be required for pump installed options)*

- CLOSED LOOP VALVE OUTPUT – Any receiver that includes the closed loop option will also require the optional closed loop output wire to operate the closed loop valve solenoid. The solenoid is also wire to the 0VDC common the complete the power circuit when the output is energized.

### 8.4 Determining the Wire Needed

- Add up the number of individual wires needed for a group of machines using the explanations given in throughout Section 8, and install the same number of wire leads from the panel to that area.

### 8.5 Wire Lead Installation Methods

- The wire leads can be installed in any of the following ways:
  - Individual wires in conduit
  - Decided multi-conductor shielded cable for each receiver in a cable tray
  - Shared multi-conductor shielded cable for a group of receivers in a cable tray

### 8.6 Ethernet Cable and Connectors

- Cable: part number caEN-01 *(100 meters max between any two network panels)*  
(Braided Shielded, CAT 5E, 350 MHZ, two twisted pairs)
- Connector: part number ehcETH-mfw (straight) or ehcETH-mfw90 (90 degree)  
(Fast Connect Field wireable RJ-45 Metal Connector Plug)
- Color and Pin Cod

Pin Number	Wire Color
1	White
2	Yellow
3	Blue
6	Orange

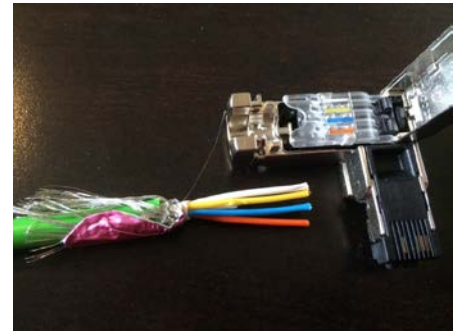


### 8.6.1 Wiring Ethernet Connectors

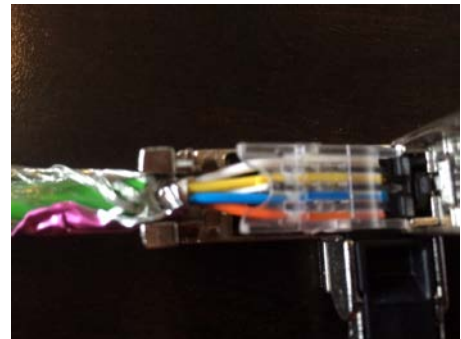
1. Remove Cable Jacket to expose 1" of Shielding and Ethernet Conductors.



2. Pull Shielding back and wrap around Jacket. DO NOT strip Conductors. Connector is Insulation Displacement type.



3. Align Conductor Colors and Connectors Colors. Slowly push Conductors into Connector Pockets until Conductors touch the end. Make sure Shielding is placed inside Twist Lock Connector.



4. Close Connector Cover. You may need to use Pliers to Close the Twist Lock Connector. Make sure the Shielding is captured in the twist lock. Remove any excess Shielding once assembled.





## 9.0 CONTROLS EXPLANATION

### 9.1 Siemens HMI

The Siemens HMI is an operator interface with touch-screen entry. The color screens are graphical in nature and display information in text and/or color change. The screens permit data entry via touch. The HMI is equipped with Profinet communication. The HMI communicates with the Siemens PLC using a fast Ethernet link.

### 9.2 Startup

When power is first applied to the HMI the Main Menu screen is displayed. Since no user is logged into the system at startup, DEFAULT is indicated in the user display.

Depending on system configuration, some buttons may not be visible on your screen.

## 10.0 OPERATOR SCREENS

### 10.1 Home Screen - Main Menu

The Main Menu screen has touch buttons to navigate to other screens

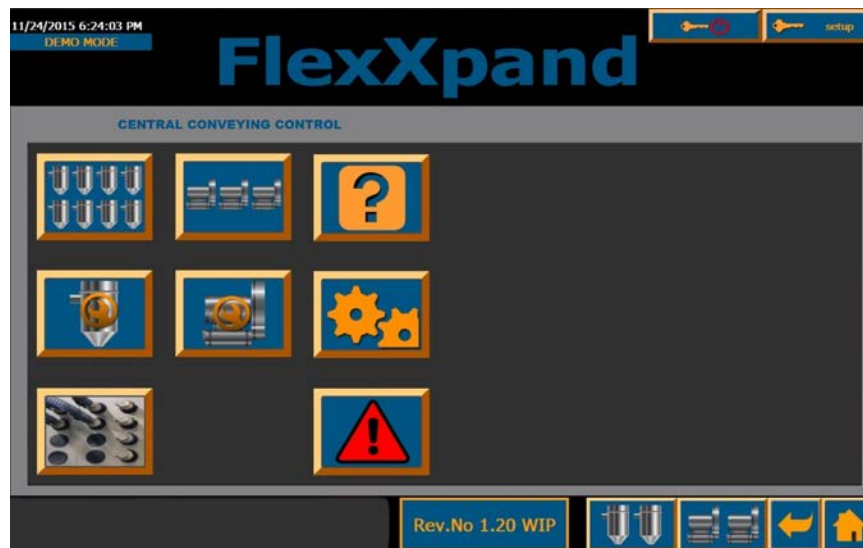


Figure 1: Default Main Menu

### 10.1 – HOME SCREEN – MAIN MENU (cont.'d)



**STATION STATUS** – This button will take the user to the station overview status page. This page allows stations to be enabled ON and OFF as well as show the status of a large number of stations on one page.



**VACUUM PUMP** - This button navigates to the Vacuum Pump status page. These pages show the status of the vacuum pumps running, loading, purging, and which station each pump is servicing. See section 11.2 for more detail.



**HELP** - This button navigates to the Help pages. These pages explain the meaning of the different symbols used and how to set the different parameters of the receiver stations.



**STATION SETUP** – This button will take the user to the parameter setup page for a receiver station. The setup page allows the user to view and adjust (if logged in to the correct password level) any station's parameters like: load time, purge time, dump time, material selection, and vacuum pump assignment.



**VACUUM PUMP SETUP** – This button will take the user to the parameter setup page for the vacuum pumps. The setup page allows the user to view and adjust (if logged in to the correct password level) a vacuum pump's seek time, vacuum breaker valve operation, current running hours and reset current running hours.



**SYSTEM SETUP** - This button navigates to the Primary System Setup page. Which is primarily used for the initial setup of the system by the administrator.



From SYSTEM SETUP page, press this button to access the Advanced Setup page 2.



**AUTO ID SETUP** – This button takes the user to a page where material sources can be matched to specific vacuum receiver destinations.



**ALARM HISTORY PAGE** - This button navigates to the Alarm History Page. This page shows all logged alarms, when they happened and when they were acknowledged.



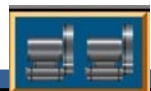
**HOME SCREEN** – This button will take the user to the home, main menu page at any time. It is conveniently located in the same place on each page of the control and aides the user in navigation by allowing an easy return to the main menu (home) screen at any time



**BACK BUTTON** – Pressing this button allow you to return to the previous page that was visited.



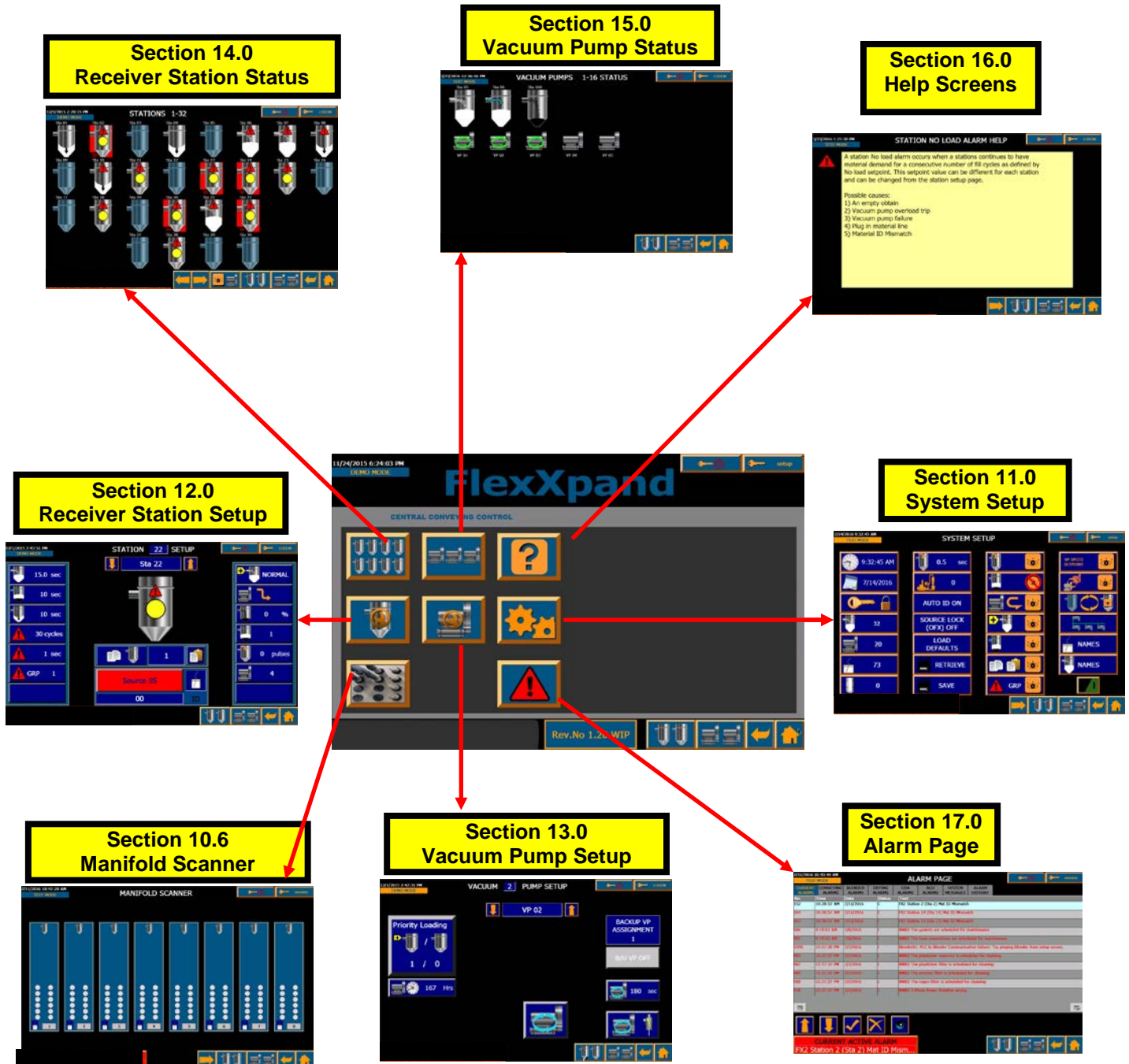
**STATION STATUS BUTTON** - Pressing this button on any screen will display the station status screen.



**PUMP STATUS BUTTON** - Pressing this button on any screen will display the pump status screen




## 10.1 Home Screen – Main Menu (cont.'d)



## 11.0 SYSTEM SETUP PAGE 1 – BASIC FEATURES

**DATA ENTRY NOTE:** After entering a value into a parameter field, touch the RETURN or ENTER key to retain the new value.

**BUTTON BORDERS:**  An orange border indicates the button is enabled. A gray border indicates the button requires login at the appropriate user level for access.

*NOTE: All functions for this screen require 'Setup' Level password Access.*



### 11.1 Date and Time



Set Time of Day. Requires 'Level3' User Level access to make changes



Set Date. Requires 'Level3' User Level access to make changes

### 11.2 User Levels and Passwords



Press for immediate LOGOUT from the current user level.  
(top right of screen)



Displays current User Level status.

Press the LOGON button to open the 'Log on' Dialog Box.

This box is also accessed when a parameter button is pressed and the current user level does not have permission to access that function.

Touch the User field, type in the desired User Name, and press 'enter'.  
Touch the Password field, type in the correct password, and press 'enter'.  
Click 'OK' to continue.

Password factory defaults:

level1 : 1111 (Operator)  
level2 : 2222 (Material Handler)  
level3 : 3333 (Maintenance)  
Setup : 4444 (Supervisor)

### 11.3 Changing User Level Passwords

Press this button  to access the **Password Setup screen**.

Requires 'Setup' User Level access to make changes.

To **SELECT A USER LEVEL**, press on the desired User Level name on the left side of the screen.

If 'level2' is pressed, the following screen and dialog box are displayed:



User	Password	Group	Logoff time
level1	*****	users	0
level2	*****	level1 group	5
level3	*****	level2 group	5
novatec	*****	novatec group	5
pass	*****	pass group	5
level3 group	*****	level3 group	5
setup	*****	level3 group	5

To **ENTER A NEW PASSWORD**, type in your desired password for 'level2' in the 'password' field and press 'enter'.

Passwords can be any combination letters and numbers up to 24 characters.

Passwords are case sensitive.

After entering your new password, press 'enter'. Click 'OK' to continue.



User	Password	Group	Logoff time
level1	*****	users	0
level2	*****	level1 group	5
level3	*****	level2 group	5
novatec	*****	novatec group	5
pass	*****	pass group	5
level3 group	*****	level3 group	5
setup	*****	level3 group	5

To **CHANGE THE DEFAULT LOGOFF TIME** for the selected user level, touch the Logoff time data field, type in your desired time value, and press 'enter'.

Logoff Times are expressed in minutes, and can range from 1 – 60.




Default Logoff Time is 5 minutes.

Press 'OK' to finish password setup for 'level2'.

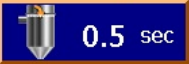


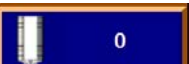



User	Password	Group	Logoff time
level1	*****	users	0
level2	*****	level1 group	3
level3	*****	level2 group	5
novatec	*****	novatec group	5
pass	*****	pass group	5
level3 group	*****	level3 group	5
setup	*****	level3 group	5

## 11.4 Defining The Installed Devices

-  **64** Sets the number of Receiver Stations the panel will control. Requires 'Setup' User Level access to make changes. (1-160 depending on I/O)
-  **5** Sets the number of Vacuum Pumps the panel will control. Requires 'Setup' User Level access to make changes. (1-20 depending on I/O)
-  **25** Sets the number of Material Source Purge valves the panel will control. Requires 'Setup' User Level access to make changes. (1-73 depending on I/O)

## 11.5 Options and Visibility

-  **0.5 sec** Sets the duration of receiver blowback pulses (when installed). Requires 'setup' user level access to make changes.
-  Select whether to make the Station Blow Back button **VISIBLE** or **INVISIBLE**  on the Station Setup Screen. Requires 'Setup' User Level access to make changes.
-  **0** Allows monitoring of Silo Level Indicators for up to 12 silos if they are connected to the system. A non-zero number will also make the Silo Monitoring button visible on the Home Screen / Main Menu. Requires 'Setup' User Level access to make changes. (0-12 depending on I/O)
-  **0** Allows monitoring status of up to two railcar unloaders and Silo fill ID proofing control if they are connected to the system. (0-2 depending on I/O)

**AUTO ID OFF**

↔

**AUTO ID ON**

**Auto-ID Source-to-Station Proofing Option**

Push to toggle AUTO ID function 'On' or 'Off' on System Setup (page 25). Auto ID 'ON' requires FXM2 expansion I/O panels to be installed and wired to a Quick Select Manifold (QSM) source-to-destination selection station equipped with Auto-ID wiring option (see Section 7). "Setup" level access is required to make changes.

When 'On', this feature verifies a receiver station is connected to its assigned material source. The verification is accomplished through control signals made possible by the correct physical connection between the receiver drop hose connection, and the source manifold connection at the QSM selection station.

The source valve is not permitted to energize when the Auto-ID connection is not correctly verified. This prevents the incorrect material from being transferred to a station.

SEE SECTION 18.8 TO CUSTOMIZE AUTO-ID STATION / MATERIAL OPERATION.



**SOURCE LOCK (OFX) OFF**

**Toggles source lock from central drying system On/Off.**







**Select whether to make Blowback button **VISIBLE** or **INVISIBLE**  on the Station Setup screen. Requires 'Setup' User Level access to make changes.**

 Select whether to make the Proportioning button VISIBLE or INVISIBLE  on the Station Setup Screen. Requires 'Setup' User Level access to make changes.



 Select whether to make the Closed Loop Convey button VISIBLE or INVISIBLE  on the Station Setup Screen. Requires 'Setup' User Level access to make changes.


 Select whether to make the FILL TIME button VISIBLE or INVISIBLE  on the Station Setup Screen. Requires 'Setup' User Level access to make changes.



 Select whether to make PURGE time VISIBLE or INVISIBLE  on the Station Setup screen. Requires 'Setup' User Level access to make changes.

 Select whether to make COPY/PASTE station settings VISIBLE or INVISIBLE  on the Station Setup screen. Requires 'Setup' User Level access to make changes.



 Select whether to make ALARM GROUP station setting VISIBLE or INVISIBLE  on the Station Setup screen. Requires 'Setup' User Level access to make changes.

 Select whether to make CONVEY SPEED station setting VISIBLE or INVISIBLE  on the Station Setup screen. Requires 'Setup' User Level access to make changes.


 Select whether to make Backup Pump VISIBLE or INVISIBLE  on the Station Setup screen. Requires 'Setup' User Level access to make changes.

 Select whether to make a particular station receiver VISIBLE or INVISIBLE  on the Station Status screen. For example, in the page at the right, stations 30-32 will not be visible on the Station Status screen.




  Navigation Arrow buttons show the status of the NEXT or PREVIOUS screen set of station receivers.

## 11.6 Saving Control Settings

 Press this button to reset all settable parameters back to factory default values.

 Press this button to retrieve previously saved settable parameters.

 Press this button to save all settable parameters to create a snapshot of existing control setup.



## 11.7 Enables Expansion Panels (Xpand Remote I/O panels)



**Sta:** Station Node

**VP:** Vacuum Pump Node

**Mat SV:** Material Source Valve

**ID Out Sta:** Auto ID for Stations

**ID In Mat:** Auto ID for Material Sources



This button navigates to the Remote I/O's screen where the user can Enable and Disable communications with installed Remote I/O panels. Requires 'Setup' User Level access to make changes.

Remote I/O panels expand the number of devices for connection to, and control by, the FX2 main panel. SEE SECTION 7.0 FOR CONTROL EXPANSION DETAILS

Disabled Node  
Normal Status



The Node is disabled.  
(On/Off button is in the Off position or Red).

The FX2 control is not trying to communicate with the node.

Enabled Node  
Normal Status



The Node is enabled (button is Green), and the FX2 control is communicating with it.

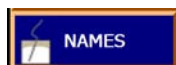
ie: the communication from FX2 to remote node is 'HEALTHY'.

Enabled Node  
FAULT Status



The Node is enabled (button is Green), but the FX2 control is NOT communicating with the node.

ie: the communication from FX2 to remote node is in 'FAULT'. Verify cable integrity, connections, network communications, as well as the remote panel IP Address and name (See Section 7).



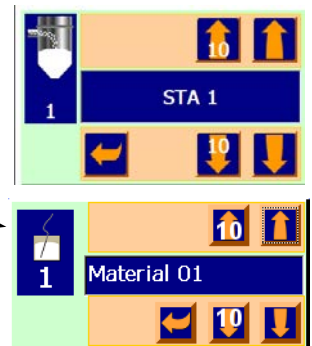
Material Source names button. Press to get dialog box where Material Name can be entered.




Material Destination Station Names button. Press to get dialog box where Station Name can be entered.

Assigning Material Source or Station NAMES requires 'level2' User Level access.

Touch the Material or STA Name field, type your new material name, and press 'enter' to save. Click to exit.



## 12.0 STATION SETUP

Press  the STATION SETUP button on the HOME page to access the Station Setup screen. This screen contains operating parameters for each individual receiver station.

You can also access STATION SETUP from the Station Status screen by pressing a loading station icon for 3 seconds.



The station will be outlined in green.

This will call up the parameters for that

Particular STATION SETUP and display the station

parameters as shown. Anyone can view a station's setup parameters, but login levels are needed to make changes to most parameters as described in the following summary.



### **NOTE: STATION MUST BE DISABLED TO CHANGE OPERATING PARAMETERS!!!**

Push the Receiver ICON to toggle the Receiver ON/OFF.



RECEIVER ENABLED  
(ON)



RECEIVER DISABLED  
(OFF)



**STATION DISABLED – WAITING FOR FILL CYCLE TO COMPLETE.** When a station is disabled during a fill or dump cycle, a red dot will appear to give the operator visual feedback that station has been toggled from ENABLED to DISABLED. When the current dump cycle is completed, the icon will change to OFF (see above).



The Down Arrow toggles through to PREVIOUS Station numbers as needed. If the HMI is currently showing parameters for Station 1 when this button is pressed, the controller will rollover to highest numbered station.



The Up Arrow toggles through to NEXT Station numbers as needed. If the HMI is currently showing parameters for the highest station number when this button is pressed, the controller will rollover to station 1.



Pressing the station name between the ARROW buttons will allow the station NAME to be changed. A typewriter keyboard for letter and number entry will appear. Up to 8 characters can be entered for a station name.

## 12.1 Station Timers



**Fill Time** - the time in seconds that material enters the convey air stream. It is the time the material purge valve is open. The station Tee valve will also be open. This setting is proportional to the station capacity, material bulk density, and how well the material flows. Requires password "level1" to make changes.

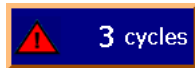


**Purge Time** - the time in seconds that the station Tee valve is still open but the material purge valve is closed. This time is proportional to the distance from the material purge valve and the station hopper and how well the material flows. Requires password "level1" to make changes.



**Dump Time** - this is the time that the material takes to fall from the receiver vessel into the drying hopper. This time is proportional to how difficult the material flows. Requires password "level1" to make changes.

## 12.2 Station Alarm Settings



**No Load Alarm – CYCLES:** Identifies the number of consecutive loading cycles that the station is filled without satisfying the 'Demand' condition, or 'No Load' requirement.

Requires password "level1" to make changes.



**No Load Alarm – SECONDS:** Identifies the number of seconds the demand signal must remain 'open' during a Dump Cycle to validate material transferred during the Fill Cycle. If the Fill is validated, the No Load Alarm Cycles count does not increment and is reset to zero.

This function prevents nuisance alarms when filling large vessels.

The time value setting should be approx. 3 seconds less than the measured time for a full load of material to discharge from the station. Set SEC = 0 to ignore discharge time (ie: material demand must be satisfied in the selected CYCLES (use for JIT applic.).

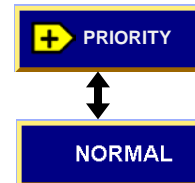
Requires password "level1" to make changes.



**Alarm Group** – Identifies the alarm group output assigned for the station.

When system is equipped with FXM2-AGxx expansion panel, the assigned output will energize when the station No Load Alarm condition occurs.

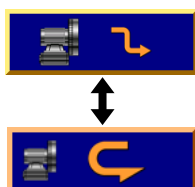
## 12.3 Priority Loading




This is used to designate the how the station will be serviced in its assigned pump queue. All 'Normal' Stations will enter their pump queue and be filled based on a FIFO basis (first in, first out). All 'Priority' stations enter a separate FIFO queue for their pump. The queues are satisfied according to the pump's PRIORITY RATIO to minimize wait time for high usage stations. Ratios should be assigned to distribute pump conveying time according to expected loading for priority and normal station groups. (See Pump Setup Section 10.4 for more information). Requires password "level3" to make changes.

Use CAUTION when assigning 'Priority' status to avoid starving 'Normal' stations.

## 12.4 Open / Closed Loop Convey



Open Loop conveying  exhausts pump air to ambient. Closed Loop conveying guards against material moisture absorption by returning the pump exhaust air to the material source for conveying. A Closed Loop valve (CLV) is required between the pump exhaust and closed loop source to use this function. Requires password "level2" to make changes.

## 12.5 Regrind Proportioning



**Regrind Percent** – Allows the user to select a proportion of regrind to be conveyed with Virgin pellets into the station. A Proportioning Valve is required at the inlet of the Station. This value is a percentage of the FILL time. For example, if the FILL time was 10 seconds and the Regrind Percent was 30%, then the proportioning valve will energize for 3 seconds to fill regrind material, and then virgin material will fill for the remaining 7 seconds. Requires password "level1" to make changes.

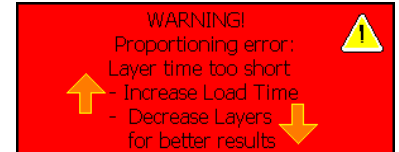




**Regrind Layers** – Allows the user to select the number of Regrind Layers created when using the Regrind % option. Multiple layers provide better mixing of Virgin and Regrind materials. MIN VALUE = 1 (default). MAX VALUE = 4.

Layer Guidelines:

- Layer FILL Times should be 2 seconds or longer for best results.
  - Calculating LAYER FILL TIMES for Virgin and for Regrind:
    - ➔ Divide FILL TIMES for Virgin and Regrind by the 'Regrind LAYERS' value (see Regrind % more about FILL TIMES).
- PROPORTIONING ERROR: Layer Time Too Short
  - Displayed when a Layer FILL Time < 2.
  - To clear the warning:
    - Decrease number of LAYERS.
    - Increase FILL time if receiver size permits (do not overfill).
- PROPORTIONING ERROR: Single Layer for Purge
  - Displayed when PURGE>0 and LAYERS>1
  - To clear the warning:
    - Set PURGE = 0 or LAYERS = 1.



## 12.6 Blowback



**Blow Back** – OPTION. If the controller is equipped with Blow Back option, the user can define the number of filter cleaning compressed air pulses that will occur during the dump cycle. Also requires optional Station Blowback accumulator and solenoid valve. Requires password "level3" to make changes.

## 12.7 Station Pump Assignment



**Vacuum Pump** – Identifies the pump number that is physically piped to the station's vacuum valve. Requires password "level3" to make changes.

## 12.8 Material Source Selection (for a Station)



**Selected Source** – Press this button to access a menu to assign a material source to the displayed station. This material assignment serves two important functions:

1. Identifies the material purge valve to energize during the load cycle.
  2. Identifies the material source for sharing across multiple pumps.
- Requires password "level2" to make changes.


Source 24	24	    
Source 25	25	
Source 00	0	
Source 01	1	
Source 02	2	

## 12.9 Station Copy Settings



When multiple stations share the same setup parameters, you can quickly copy them from one to another. Enter the Station Number with the settings to be copied. Press the PASTE button and settings from copied station will replace the current values. Requires password "level3" to make changes.

### 13.0 VACUUM PUMP SET-UP

Touching the VACUUM PUMP SETUP  button on the HOME screen will call up the screen to view and change parameters for a particular vacuum pump. The VP runs intermittently depending on the loading cycle. If no station is calling for a load cycle, the VP will run for the seek time and then stop.



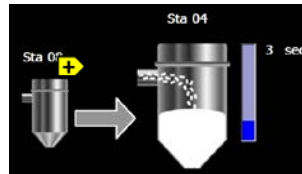
The Down Arrow toggles through to PREVIOUS vacuum pumps as needed. If the HMI is currently showing parameters for Vacuum Pump 1 when this button is pressed, the controller will rollover to highest numbered vacuum pump.




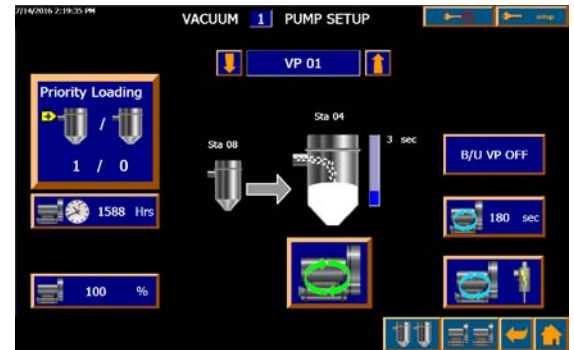
The Up Arrow toggles through to NEXT vacuum pumps as needed. If the HMI is currently showing parameters for the highest vacuum pump number when this button is pressed, the controller will rollover to Vacuum Pump 1.

VP 01

This button allows the user to apply an 8 character name to the vacuum pump. VP 01 – VP 20 are the default names.



The center station receiver will display the station name the vacuum pump is currently servicing and its fill cycle status. The load and purge times are shown on the right as a vertical bar graph counting down the seconds remaining. On the left is shown the name of the next station in the vacuum pump's queue (if any) to be serviced.  indicates the PRIORITY station.



#### 13.1 Enable / Disable



Indicates a DISABLED pump. Press it to toggle the vacuum pump to be ENABLED. When a vacuum pump is DISABLED, no new stations will be added to its FIFO queue to be serviced to receive material.



Indicates an ENABLED pump. Press it to toggle the vacuum pump to be DISABLED. Only an ENABLED Vacuum Pump will service stations to convey material. Green circular arrows indicate the vacuum pump is operating in normal CONVEY mode.



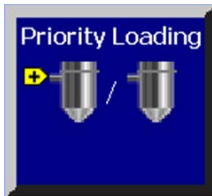
The red dot indicates that the vacuum pump is about to be DISABLED. Only after ALL the stations that it is currently servicing AND in its FIFO queue are done loading, will the vacuum pump go to seek and then to DISABLED.



Pump SEEK mode operation is indicated by blue circular arrows. This occurs when all material demands for assigned stations have been satisfied. The vacuum pump will stop when the seek timer counts down to zero, or return to CONVEY mode if an assigned station demands material.

### 13.2 Priority Loading Setup (per pump)

wait  
ratio



This button sets the PRIORITY LOADING RATIO the pump will follow.

➡ indicates the PRIORITY station. The vacuum pump alternately loads both station types according to the Ratio you enter. The numbers identify the consecutive loads for the station type if demands exist. Use this feature to minimize time for high usage stations. Default is 01 / 01. Customize if desired so that the of loaded material is approximately the same as the ratio of consumed material.

Example:

- 3 priority stations: combined rate = 2000 pph; station size = 33 lb.
- 8 normal stations: combined rate = 500 pph; station size = 12 lb.

Set the Priority Loading Ratio to 03 / 02 to ensure:

- Wait time for Priority Stations is limited to 5 load cycles or less.
  - Priority stations load 3 out of 5 cycles if demands exist.
  - Ratio of loaded material matches ratio of usage: 99lb / 24lb. ~ 2000pph / 500pph ~ 4 / 1
- 'Normal' Stations are guaranteed to be serviced.

### 13.3 Pump Operating Hours

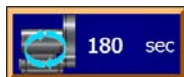


This frame shows the number of hours the vacuum pump has been running since the last reset. Pressing the button will access the timer reset button.



Pressing Reset will clear the hour meter (ie: Hrs=0). Pressing ➡ will close the Reset Box without resetting the running hours. Requires password "level3" to make changes.

### 13.4 Vacuum Breaker Valve and Seek Time

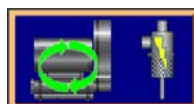


This button displays the Seek Time assigned to the vacuum pump. The Seek Time is the length of time, in seconds, that the vacuum pump will run after all its assigned stations have been filled, and no additional station demands exist. This feature requires a Vacuum Breaker Valve on the inlet of the vacuum pump (standard on Novatec units).

Using Seek Time prevents excessive starts of the vacuum pump to protect the pump unit, motor and motor starter against premature failure. The default value is 180 seconds. DISABLE Seek Time by entering a value of '0' seconds (for pumps not equipped with a vacuum breaker valve). Requires password "level3" to make changes.



This button toggles the operation of the Vacuum Breaker Valve (VBV) between energized to break vacuum, or energized to pull vacuum and convey material. The VBV opens to pull ambient air at the vacuum pump during Seek Time, removing vacuum from the system when no station fill demands exist.



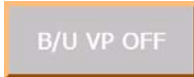
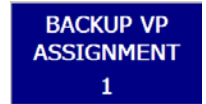
The blue arrows indicate the VBV is energized to break vacuum (Novatec standard). The green arrows indicate the VBV is energized to pull vacuum and convey material (some non-Novatec equipment). Requires password level "Setup" to make changes.

### 13.5 Backup Pump On / Off



This button enables the backup pump to run in place of the current pump. The backup pump (if installed) will begin running immediately if any of the stations assigned to the current pump have a demand. Press button again to resume normal pump operation.

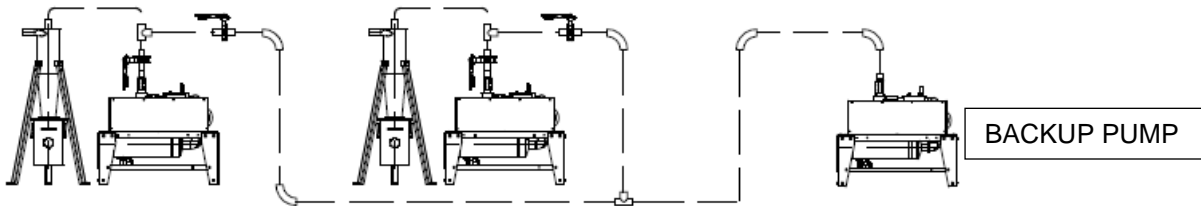
When the backup pump is active for the displayed pump, the button changes to orange and displays B/U VP ON'. A new panel appears above the button indicating the pump number using the backup pump.



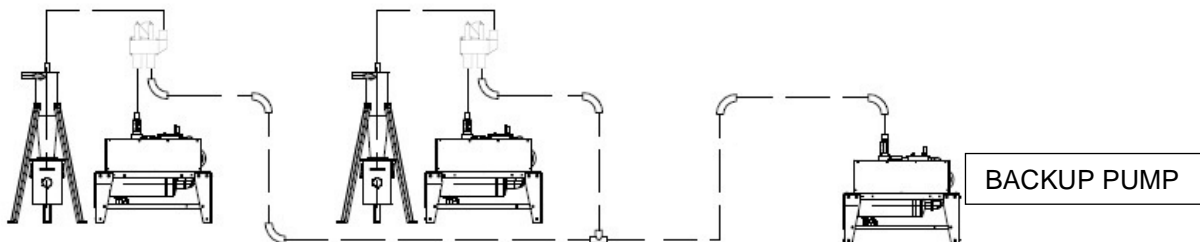
When the backup pump is active for another pump, the button changes to gray to indicate it is not available for use with the displayed pump.

The control can be equipped with optional outputs to operate automatic vacuum line switching valves (sold separately).

**CAUTION: IF MANUAL VACUUM AIR CONNECTIONS ARE USED, THE VACUUM LINE FROM THE CURRENT PUMP MUST BE CONNECTED TO THE BACKUP PUMP PRIOR TO ENABLING THE BACKUP, OR DAMAGE MAY RESULT.**



Typical Backup Pump Arrangement – Manual Air Connections (Butterfly Valves shown)

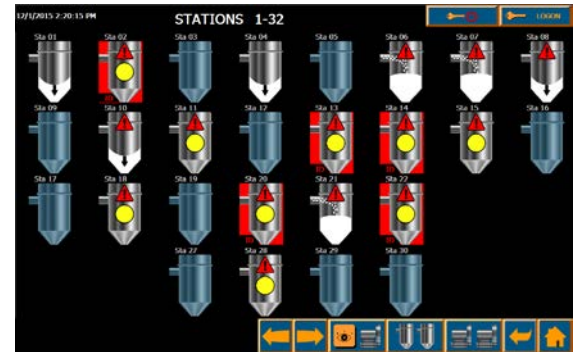


Typical Backup Pump Arrangement – Automatic Air Connections (EPV Valves shown)

## 14.0 RECEIVER STATION STATUS



Touching the **STATION STATUS** button on the main menu page or most other pages, will call up the screen to view the status of receiver stations. This screen permits the **Enable / Disable control** by momentarily touching the desired station icon. Enabling a receiver permits it to be automatically serviced by the conveying panel. A receiver may be enabled or disabled at any time. If a receiver is in a fill cycle when it is disabled, the cycle will continue to completion.



**Access a Station Setup Screen** by pressing and holding that station for approximately 3 seconds (background will turn green). When released, the display navigates to the Station Setup Page.  
➔ Indicates **PRIORITY** is assigned to the station.

### 14.1 Receiver Status Graphics Guide



**DISABLED/OFF** – The Receiver is disabled – no material will convey to it.



**ENABLED** - This icon indicates that the receiver is enabled – and material will be conveyed to it if the material level switch below it is not satisfied, its vacuum pump is enabled and not faulted.



**ENABLED VIRGIN MATERIAL ONLY** – The Receiver is **ENABLED** – material will be conveyed to it if the material level switch is not satisfied and its vacuum pump is not faulted. This icon shows that the receiver station is not using regrind and it has no demand for material because it is full.



**ENABLED VIRGIN WITH REGRIND MATERIAL** – The receiver is **ENABLED** – material will be conveyed to it if the material level switch is not satisfied and its vacuum pump is not faulted. This icon shows that the receiver station is using virgin and regrind and it has no demand for material because it is full.



**DISABLED** in the middle of a fill or dump cycle – The red dot will appear to give the operator visual feedback that station has been toggled from **ENABLED** to **DISABLED**. The fill and dump cycle icons will continue to show the status of the station receiver with the red dot present. When the dump cycle is complete, the icon will change to **OFF** (see above).



**DEMAND** – The Receiver is enabled, not in the fill cycle, and the level switch calls for material. The receiver will be placed in the FIFO and will fill when its vacuum pump becomes available.



**VIRGIN** (Virgin material only) - The Receiver is in the loading virgin material portion of the fill cycle. The station Tee valve is open and the material source valve is energized open permitting material to be conveyed to the vacuum chamber.



**REGRIND** – The Receiver is in the loading regrind material portion of the fill cycle. The station Tee valve is open and the proportioning valve is energized to draw regrind material.





**VIRGIN WITH REGRIND** - The Receiver is in the loading virgin material portion of the fill cycle. Regrind material has already been loaded. The station Tee valve is open and the material source valve is energized open permitting material to be conveyed to the vacuum chamber.



**PURGE VIRGIN WITH REGRIND MATERIAL** – The Receiver is in purge portion of the fill cycle. The station Tee valve is open and the material source valve is closed allowing the conveying line to be purged free of any remaining material.



**PURGE VIRGIN MATERIAL ONLY** – The Receiver is in purge portion of the fill cycle. The station Tee valve is open and the material source valve is closed allowing the conveying line to be purged free of any remaining material.



**DUMP VIRGIN WITH REGRIND MATERIAL** – The Receiver is in the dump cycle after the fill cycle. The Station TEE valve closes, removing vacuum from the hopper. The material conveyed into the hopper gravity conveys (dumps) into the molding machine or drying bin.



**DUMP VIRGIN MATERIAL ONLY** – The Receiver is in the dump cycle after the fill cycle. The Station TEE valve closes, removing vacuum from the hopper. The material conveyed into the hopper gravity conveys (dumps) into the molding machine or drying bin.



**ALARM** – The receiver has gone through the fill cycle, without satisfying the material level prox sensor, a consecutive number of times equal to or greater than the no load alarm set point. The red triangle will remain until either the material prox is covered with material or the station is DISABLED. The alarm is for indication only and does not prevent the station from attempting to load material.

## 14.2 Scrolling to Station Status Screens

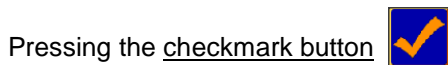


Navigation Arrow buttons to show the status of the NEXT or PREVIOUS set of station receivers.

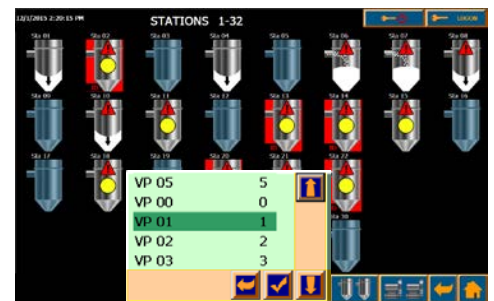
## 14.3 Station Status Screen Filter (by pump)



The STATION VP ASSIGNMENT FILTER button allows the operator to see quickly which stations are assigned to a particular vacuum pump. When the button is pressed, a pull-down menu appears allowing the operator to select a vacuum pump.



Pressing the checkmark button applies the selected vacuum pump filter and returns to the Station Status screen.



When a pump is selected, the Status Screen view will limited to only the stations assigned to the selected vacuum pump.



The Filter button displays the selected vacuum pump when active.

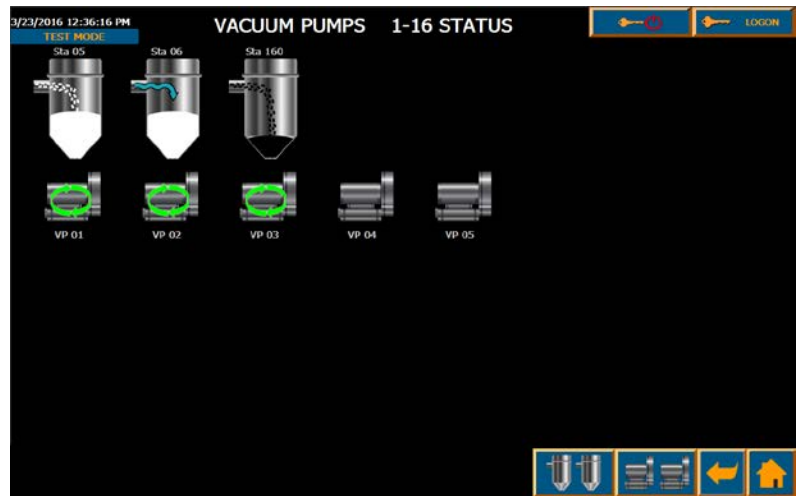
The filter is automatically removed after 30 seconds of inactivity while viewing the Station Status screen. VP 00' displays all stations for all pumps. This is the default view.

**EXAMPLE:** When "VP 01" is selected, all the stations assigned to vacuum pump 1 remain visible. Stations assigned to all other pumps will be invisible. All stations can be viewed again by selecting 'VP 00', or after 30 seconds of inactivity while viewing the Station Status screen.

## 15.0 VACUUM PUMP STATUS


This overview status screen displays the operation of the Vacuum Pump Units. Depending on model, up to 20 vacuum pumps can be monitored with up to 16 per page. The status of each Vacuum Pump is displayed; this includes the current station being serviced in a station icon that appears above the vacuum pump icon.

The Vacuum Pump runs intermittently depending on the loading cycle. If no station is calling for a fill cycle, the VP will run for the seek time and then stop.



If a vacuum pump is servicing a station receiver, then the icon of the station will appear above the vacuum pump icon. This station icon will display the station name and the proper icon for where the station is in the fill cycle. See section 15.1 for a list of status icons and their definitions.

The vacuum pump also has icons to show its status.

 Indicates PRIORITY is assigned to the station.

## 15.1 Pump Status Graphics Guide



The vacuum pump is **DISABLED**. Press the vacuum pump icon to go to the Vacuum Pump Setup page to **ENABLE** the pump.



The vacuum pump is **ENABLED** and stopped. There are no system station demands for material so the pump is off until a material demand enters its FIFO queue.



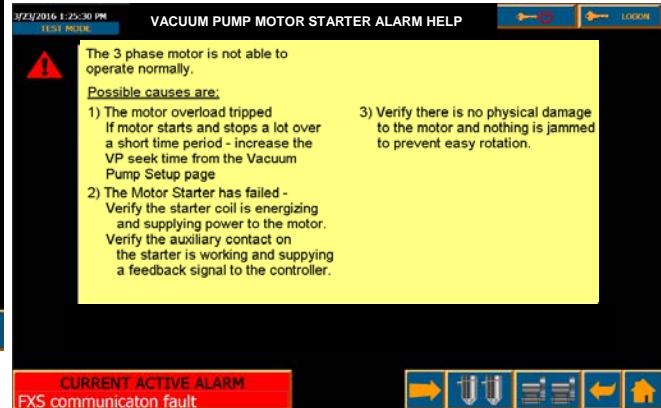
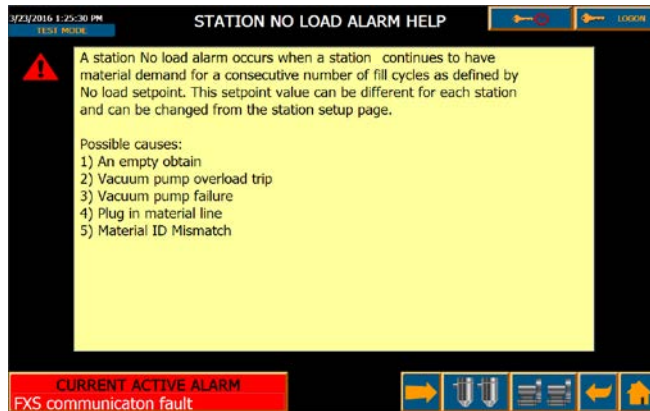
The vacuum pump is **ENABLED** and conveying material. There will be a station icon above it to indicate the station being loaded.



The vacuum pump is running in idle **SEEK** mode. It is not servicing any stations. It is waiting for the time period defined by the SEEK timer before turning off. The function of the seek time is to prevent excessive starts

## 16.0 HELP INFORMATION SCREENS

A series of screens are provided to assist the user in understanding some of the more commonly used icons and setup parameters.



Navigation Arrow buttons to go to the NEXT or PREVIOUS Help topic screen.



This button navigates to the Station Status page.



This button navigates to the Vacuum Pump Status page.



This button navigates back to the previous page.



This button navigates back to the Main Menu page.

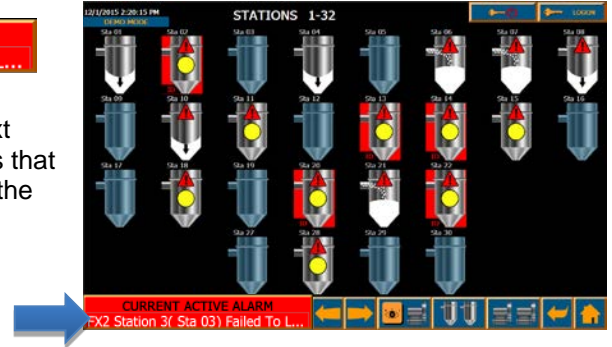


## 17.0 ALARM BANNER

A new alarm will be displayed in a message banner that runs along the bottom left hand corner of any screen. The Alarm Banner will only be visible if alarms are present. Specific text detailing the Alarm will be displayed on the banner. Alarms that become cleared will disappear from the alarm banner when the alarm status returns to normal values.

By simply pressing the Current Active Alarm Banner, the Alarm History Screen will appear.

**CURRENT ACTIVE ALARM**  
FX2 Station 3( Sta 03) Failed To L...



## 17.1 Alarm History

The ALARM HISTORY screen displays the last 100 ALARM CONDITIONS. ALARM SILENCE on the front of the control panel will silence the horn until another NEW alarm appears.

Acknowledging an alarm will log the time when the alarm was acknowledged. An acknowledged alarm will be deleted from the Alarm History when its alarm condition has been cleared.

7/19/2016 2:21:20 PM

LESS > MORE

**ALARM PAGE**

CURRENT ALARMS CONVEYING ALARMS BLENDER ALARMS DRYING ALARMS CDA ALARMS SYSTEM MESSAGES ALARM HISTORY ALL ALARMS

No.	Time	Date	Status	Text
18	2:21:05 PM	7/19/2016	C	FX2 Station 18( Sta 18) Failed To Load
10	2:20:53 PM	7/19/2016	C	FX2 Station 10( Sta 10) Failed To Load
91	2:20:50 PM	7/19/2016	C	FX2 Station 91( Sta 91) Failed To Load
17	2:20:50 PM	7/19/2016	C	FX2 Station 17( Sta 17) Failed To Load
551	2:18:25 PM	7/19/2016	C	FX2 P/N Soko 1-8 LOGO communication fault
550	2:18:25 PM	7/19/2016	C	FX2 P/N Soko 1-8 LOGO communication fault
96	11:56:28 AM	7/19/2016	CD	FX2 Station 96( Sta 96) Failed To Load
86	11:55:51 AM	7/19/2016	CD	FX2 Station 86( Sta 86) Failed To Load
3	11:52:03 AM	7/19/2016	CD	FX2 Station 3( Sta 03) Failed To Load
81	11:50:47 AM	7/19/2016	CD	FX2 Station 81( Sta 81) Failed To Load
6	11:50:01 AM	7/19/2016	CD	FX2 Station 6( Sta 06) Failed To Load

Page up (if you have a lot of alarms) Page down (if you have a lot of alarms) Acknowledge selected Current alarms Delete all alarms that are no longer active Go to the info page of that alarm Return to the previous page Return to Home (main) page

**CURRENT ACTIVE ALARM**  
FX2 Station 18( Sta 18) Failed To...



Page up (if you have a lot of alarms)



Page down (if you have a lot of alarms)



Acknowledge selected Current alarms



Delete all alarms that are no longer active



Go to the info page of that alarm



Return to the previous page



Return to Home (main) page



There is an Alarm Silence Button located on the front of the control panel enclosure.

### ALARM STATUS CODES:

C = Current Alarm  
CA = Current Alarm Acknowledged  
CD = Alarm Condition Cleared but Not Acknowledged

### DELETING ALARMS:

Alarms are permanently deleted from the Alarm History when the alarm condition is no longer active (cleared), and the Alarm is Acknowledged.  
**REQUIRES LEVEL3 ACCESS.**

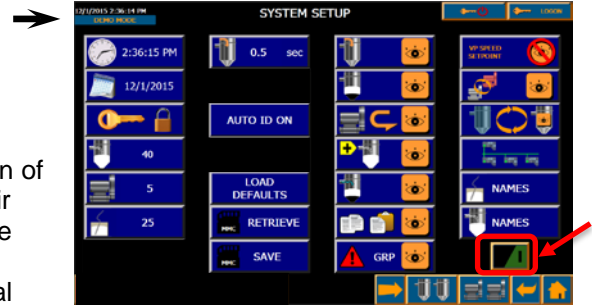
## 18.0 ADVANCED SETUP FEATURES

### System Wide ON/OFF




Push to START or PAUSE System. Going from START to PAUSE will perform an orderly shutdown of the system. Any receiver stations that were in their vacuum pumps FIFO waiting to get material, will be serviced by the vacuum pump. However, no new stations will be added to the FIFO's even if material demand is present for receiver stations.

When the system is paused, a large red indicator button will appear on top of all screens to indicate that the system is in PAUSED mode. Pressing the red button will enable the system and put it in SYSTEM RUNNING mode, which is indicated by a green indicator button.

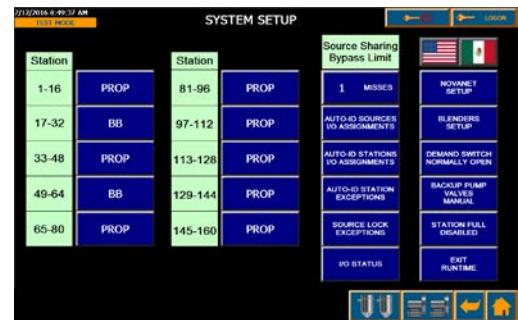


### 18.1 Advanced System Setup (Page 2)

Press  on 1<sup>st</sup> System Setup page to access Advanced System Setup functions.

The many functions that are accessible on this screen will be addressed on the next few pages.

You can select PROP (Proportioning) or BB (Blowback) for each group of 16 stations to define the function of the optional, configurable station output. This is the first of 2 available optional outputs for each station. If both Proportioning and Blowback outputs are installed, this output group configuration must be set to Proportioning (see Sections 7.0 and 7.3 for Expand Modules, and Section 14.1 for Station Functions).



### 18.2 Source Sharing Bypass Limit



Sets the number of consecutive 'Misses' or skips a Receiver Station is permitted to experience if source conflict forces that station out of its pump queue without being filled.

Source conflicts occur when a station tries to fill from an assigned material source, but the source is in use by another station assigned to another pump. When the conflict occurs, that station is removed from the pump queue without being filled, and its assigned pumps fulfills the next demand in its FIFO stack. The skipped station returns to the end of the pump FIFO stack, and will wait for its turn to fill.

When the selected number of 'Misses' is reached, the station cannot be skipped if a conflict occurs. The station will instead wait at the top of the FIFO stack for the source to be released, while its assigned pump enters 'Seek' mode. The waiting station will begin filling when the source conflict cycle is completed.

'0' setting disables this function. A setting of '1 - 2' is recommended. A larger material reserve for system stations may allow for higher settings.

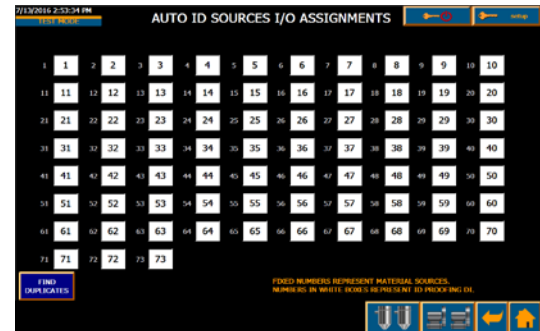
### 18.3 Auto-ID Source I/O Assignments (remapping inputs)

#### Auto-ID Sources I/O Assignments

Press to access a configuration screen to remap the Auto-ID Material (source) inputs.

See Section 10.2  
*AUTO ID ON/OFF*  
for more details

The white box beside each Auto-ID station number identifies the assigned input. This is useful when the installed conveying tubes for destination stations do not match the default Auto-ID Material (source) program sequence. For example, Auto-ID materials 17-32 are sequenced together as Expansion Module 192.168.1.127. If the source materials piped to this Module include source materials 17-25, and 46-52, the Auto-ID inputs normally assigned to source materials 26-32 can be re-assigned to source materials 46-52. (NOTE: See next section FINDING DUPLICATES)

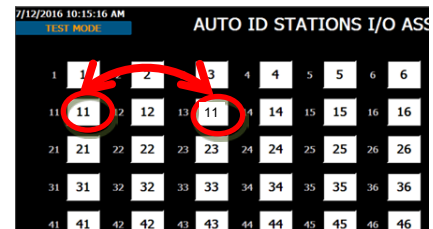


### 18.4 Finding Duplicates (remapping I/O)

#### Find Duplicates

Press **Find Duplicates** to verify all assigned outputs (or Inputs for Auto Material ID) are unique after remapping is completed. If a duplicate is found, a message will identify the Auto-ID station (or material) number where the duplicate assignment was made. Reassign outputs (or inputs) to eliminate duplicates.

In the example screen above, Output 11 is assigned to Auto-Station 11 and Auto-ID Station 13.



ID

**ALWAYS FIND DUPLICATES after changing output (or input) assignments.**

### 18.5 Auto-ID Station I/O Assignments (remapping outputs)

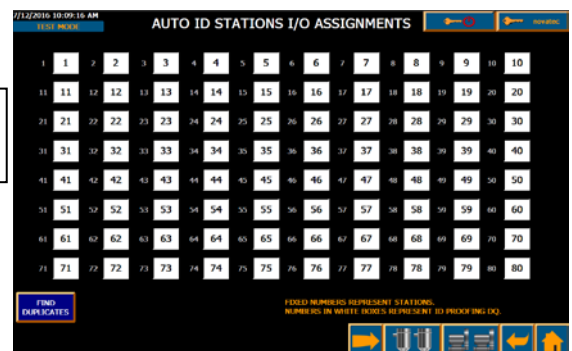
#### Auto-ID Stations I/O Assignments

Press to access a configuration screen to remap the Auto-ID Station (destination) outputs.

See Section 10.2  
*AUTO ID ON/OFF*  
for more details

The white box beside each Auto-ID station number identifies the assigned output. This is useful when the installed conveying tubes for destination stations do not match the default Auto-ID Station program sequence.

For example, Auto-ID stations 17-32 are sequenced together as Expansion Module 192.168.1.119. If the destination stations piped to this Module include stations 17-25, and 46-52, the Auto-ID outputs normally assigned to stations 26-32 can be re-assigned to stations 46-52.



(NOTE: See above section FINDING DUPLICATES)

## 18.6 I/O Status (Troubleshooting)

Press I/O STATUS button.

**I/O STATUS**

This button navigates to the I/O Status Page screen, where the user can navigate to summary screens that display the actual status of individual I/O points. This information can be used to troubleshoot wiring and hardware components during initial installation and startup, when expanding the system to add devices, or when existing devices do not operate as expected. Screen header identifies the device range, and the associated IP Address for the connected communication module.

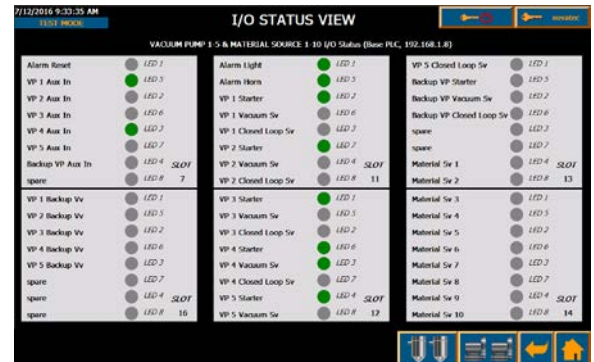
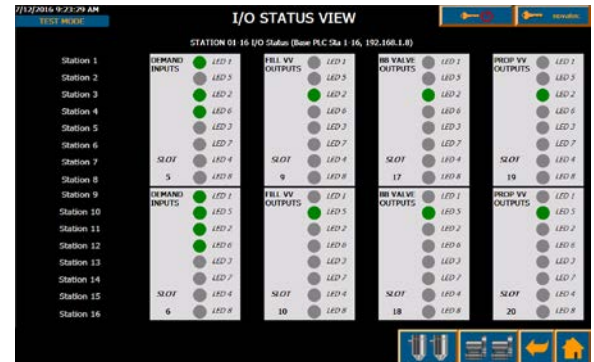
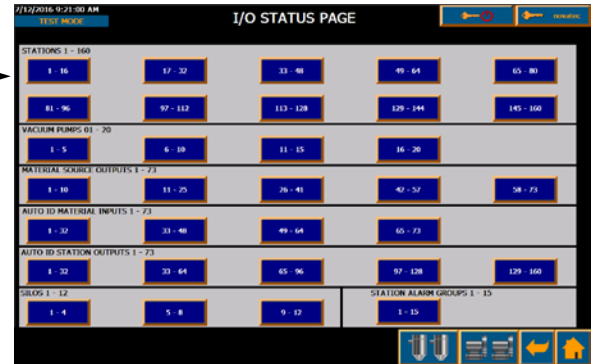
Requires 'Setup' User Level access.

**Station Summary** – organized by station number

Green = Output or Input Energized  
Red = Output of Input Not Energized  
BB = Blowback  
Prop = Proportioning (Regrind Ratio)

**Pump Summary** – organized by I/O Slot

Aux\_In = Pump Starter Auxilliary Contact  
Bck\_SV = Pump Backup Valve Solenoid Valve (opt.)  
Starter = Pump Starter Coil  
Vac\_SV = Vacuum Breaker Valve Solenoid Valve  
Closed\_Loop\_SV = Discharge Selection Valve Solenoid Valve (opt.)





## 18.7 Auto-ID Station Exceptions

### Auto ID Station Exceptions

Press to access a configuration screen to bypass individual Stations when using the Auto ID ON function.

See Section 11.5  
AUTO ID ON/OFF  
for more details

Auto-ID ON (see Section 11.5) requires a signal confirming the correct physical connection between a station and its assigned source. This signal is generated through a QSM (Quick Select Manifold) assembly equipped with the Auto-ID option. The confirming signal permits the assigned source to open during the station's conveying cycle load time.

When the Auto-ID Station Exception is toggled ON, the Station will load material from the assigned source without having an Auto-ID signal confirmation.

This feature is typically used when a central selection area delivers material with Auto-ID confirmation to a press side blender or dryer, which then delivers material to the process.

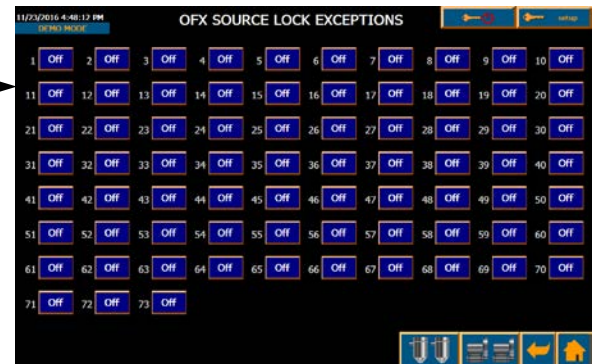


## 18.8 Pre-Dry Source Lock Exceptions

### SOURCE LOCK EXCEPTIONS

Press to access a configuration screen to bypass individual Material Sources when using the Source Lock (OFX) ON function.

Source Lock (OFX) ON prevents all material sources from operating until a 'ready' signal is received from the OFX control. Non-dried sources, and any material source not associated with an installed OFX Central Drying Hopper Control Panel, cannot operate unless individually bypassed on this screen.



In this example, Material (source) #12 'OFX Source Lock Exception' is 'ON'. This means Material (source) #12 will operate normally without a 'ready' signal from the OFX control.

## 18.9 Auto-ID Source Confirmation (Option)


Source: Source 01

### Source Connection ID

Displays the actual source connected to the station through the central QSM (Quick Select Manifold) equipped with the Auto-ID option. Visible when Auto-ID ON function status is selected (see Section 11.5), and appropriate Xpand Remote I/O Panels installed. If Source ID does not match Source Selected, an Auto-ID Mismatch Alarm is generated, and the source will not open during the station's load time cycle.



## 18.10 Silo Level Status

Touching the SILO LEVEL STATUS button  on the Home Screen (Section 10.1) will navigate to the Silo Monitoring screen to view the status of installed silos equipped with Novatec Ultrasonic Level transducers and transceiver panel, as well as high and low point level indicators.

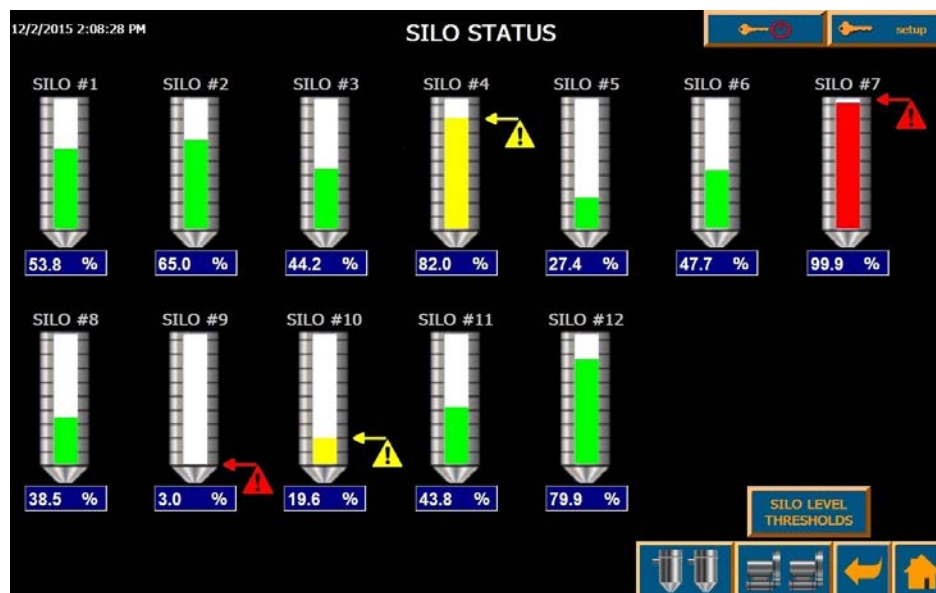
This screen provides continuous indication of the material level in the silo's straight wall section as read from the ultrasonic transceiver panel. The green bar displayed in each silo illustrates the relative material level with respect to the full sensing range. The number displayed below each silo is a scalable number indicating this same information.

When logged in at the Novatec user level, the scale factor or 'Gain' for each silo can be adjusted.

Silo Gain = 1.0: Displays silo level as a %, where full value is 99.99%.

Gain > 1.0: Displays silo level as an integer up to 6 digits, where full value is 9999 x Gain.

Novatec recommends a Silo Gain = 1.0. It's important to understand the FX2 is not an inventory control tool, and should not be used to verify supplier delivery amounts. For best accuracy and consistency across the full sensing range, please review the 'Ultrasonic Level Indicator and Control Setup' addendum (Section 13) at the end of this instruction manual. Gain < 1 is invalid.



### ADDITIONAL REFERENCES:

Section 7.0:  
*Control Expansion*


Section 7.3:  
*Topology Flow*


Section 11.5:  
*System Setup*

Section 18.10.2:  
*RCU Status*

Section 22.0:  
*Silo Level Control Setup*  
(Appendix 1)

This screen also provides level alarm indication for critical process points.

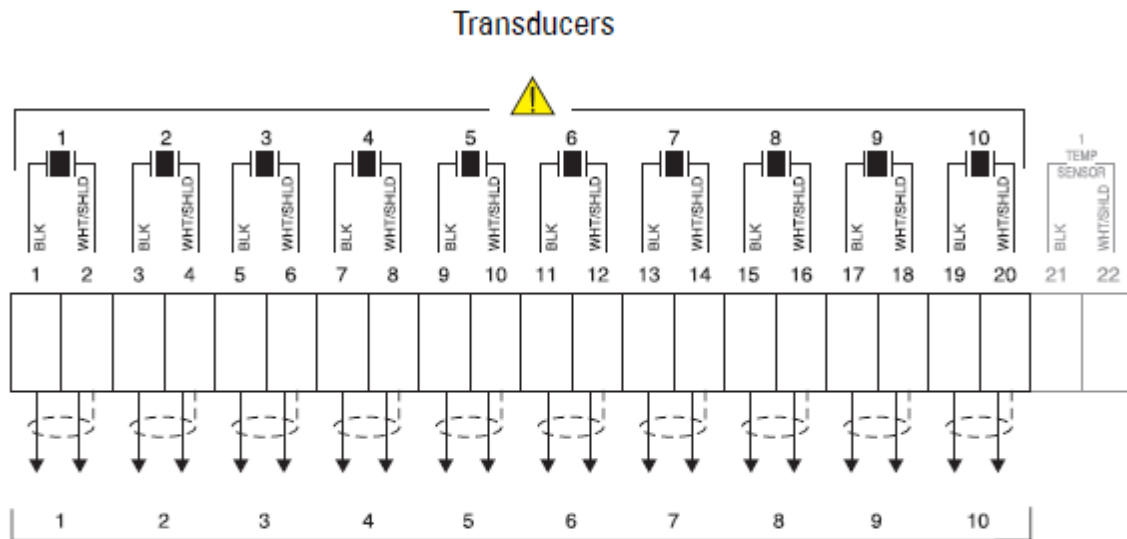
 **RED ALARM** icons identify **INSTALLED SWITCH STATUS**. When material has dropped below the installed low level indicating switch at the silo, and risen above the installed high level indicating switch while filling.

 **YELLOW ALARM** icons identify **THRESHOLD %** was reached. Settings are available for **HIGH** and **LOW** alarm thresholds to provide advanced warning of empty or full conditions.

To access **SILO LEVEL THRESHOLDS SETTING**, touch the button above Silo #5 (top center of screen). Enter the desired value (% of full) for both the Low and High Threshold.



### 18.10.1 Silo Level Connections – Transducers to LU 10 (LU 02)



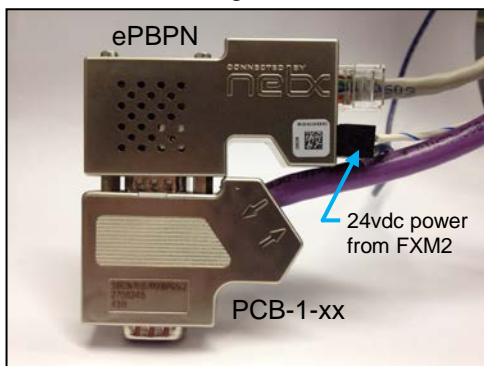
To Transducers (10 max), RG62 A / U Coax, 365 m (1200 ft) / Transducer max.

**Transducer cables must be run in a grounded metal conduit separate from other wiring (except TS-3 temperature sensor wiring, if applicable).**



**Hazardous voltage is present on transducer terminals during operation.**

#### FXM2-SILO - Plug connections

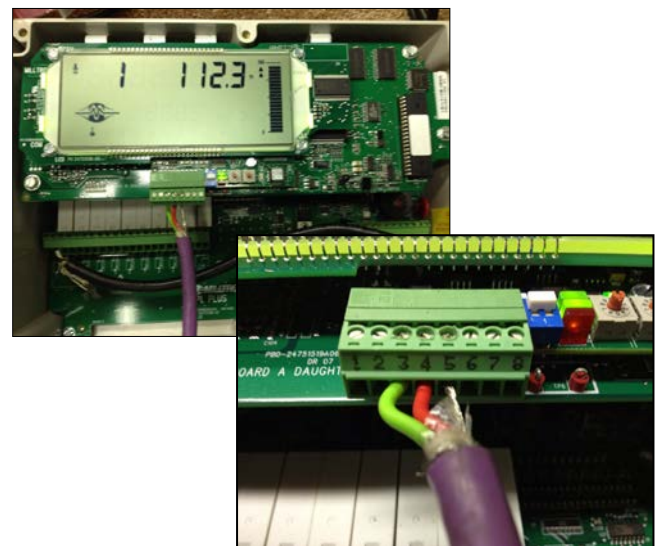


#### Profibus to ProfiNet Conversion

(included with FXM2-SILO1-4 and FXM2-SILO9-12)

- PBC-1-xx Profibus Cable (purple) to LU 10
- ePBPN Communication Converter (24 vdc input power)
- 13039 Ethernet Cable (gray) to FX2 / FXM2 (Comm Port. - ProfiNet)

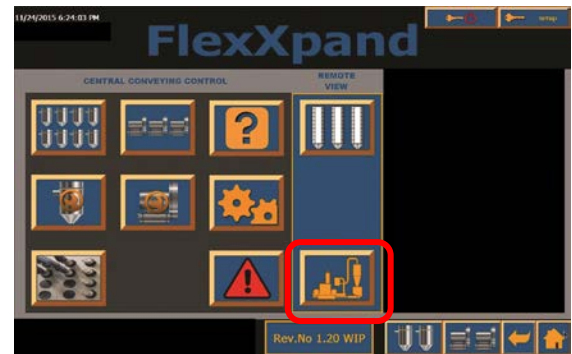
#### LU-10 (or LU-02) - Wire terminations



### 18.10.2 Railcar Unloader (RCU) Status

If enabled from the System Setup screen (section 10.2.4), the Railcar Unloader (RCU) Status information can be accessed by pressing the RCU button at the Home Screen (bottom right circled in red).

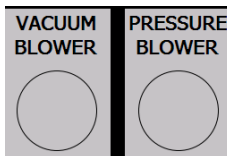
NOTE: The RCU Unit is sold separately, and must be connected directly to the FXS network via Ethernet cable to ensure uninterrupted communications for reliable information exchange.



Remote access allows the user to monitor RCU status, displaying operational information from a Novatec RCU equipped with Siemens PLC and Ethernet network connection.

Status Indicator colors:

- White = on or present
- Gray = off or not present



On / Off status indicators:

- Vacuum and Pressure Blowers
- Feeder A and B (2<sup>nd</sup> feeder optional)

Level indicators:

- Feeder Hopper A and B (high level pauses material feed from vacuum system)

Alarm Indicators:

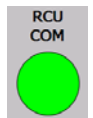
- High Pressure for pressure blower (causes system shutdown)
- High Pressure for vacuum blower (causes system shutdown with pressure side purge)



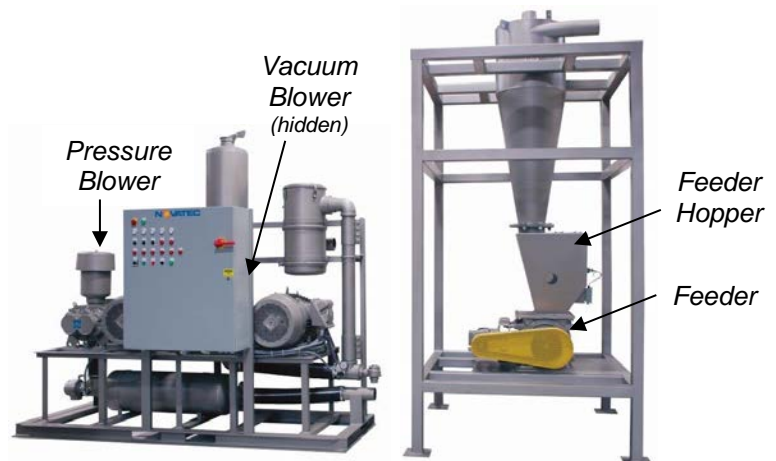
Load Silo Indicator displays silo selected for filling



Feeder A / B indicator displays airlock feeder selected for operation



Communication for RCU unit  
Green = communication established  
Gray = no communication



**RCU Vacuum / Pressure Unit**

## 19.0 REMOTE CONTROL ACCESS, NETWORKING AND HMI SETUP

The FX2 Control is able to communicate with a number of remote external devices. Accessing the FX2 from 3<sup>rd</sup> party devices using an internet browser or remote desktop application provides remote monitoring and control capabilities. Access to other network installed Novatec equipment and central controls (see Section 10.10 and 10.11) has been preconfigured and programmed.

All communications are accomplished through a hard wired Ethernet cable network, utilizing ProfiNet and Industrial Ethernet protocols. Local wireless access can be created through customer installed wireless router near the FX2 panel installation. Remote wireless access can be created through interface with customer corporate network.

### 19.1 Connecting FX2 to a Corporate Network

#### 19.1.1 Network Physical Layer

DO NOT utilize a corporate network as the physical layer (cables and routers) to connect a Novatec Control to its peripheral devices and remote I/O panels, or to connect it to other Novatec equipment and central controls. Corporate networks should access the Novatec control network via branch connection for communication purposes only.

**WARNING:** Failure to follow these instructions may prevent normal and safe operation of installed controls and their equipment.

#### 19.1.2 Prior to Connecting

The customer should review and resolve all IP address conflicts PRIOR TO CONNECTING a corporate network to a Novatec control network. See Sections 11.1.3 and 11.1.4.

#### 19.1.3 Network IP Addresses

Novatec utilizes fixed addressing scheme for its control networking topology.

IP Address: 192.168.1.xx

Subnet Mask: 255.255.255.0

A detailed list of FX2 IP addresses is included in Section 7 of this instruction manual.

#### 19.1.4 Network IP Address Conflicts

Novatec is not responsible for IP address conflicts that occur between its standard topology scheme and connected corporate networks.

**WARNING:** IP address conflicts may cause communication faults that prevent normal and safe operation of installed controls and their equipment.

If required, the HMI Subnet Mask pair stored in the FX2-HMI Setup Utility can be modified to create compatibility with the customer network (see Section 11.3 for HMI Setup instructions).

- **NOTE:** A router (not included) may be required for the PLC and HMI on the Novatec control network (192.168.1.X) to be visible on the customer network, depending on the IP address and mask used on the customer system. Have your network administrator contact Novatec Service for additional assistance.

## 19.2 Remote Access to HMI via Corporate or Wireless Network

If permitted, a wireless router can be connected to the FX2 control network to provide remote access. The FX2 can also be connected to a corporate network as outlined in section 11.1. When the FX2 has been successfully connected to an accessible network, a remote device may be used to remotely control the HMI as follows:

### 19.2.1 Connect wireless Smart Device to the FX2 accessible network

Open PocketCloud App (or similar VNC App) on Smart Device and add a manual connection link. Use FX2 IP Address 192.168.1.9 (10" HMI) or 192.168.1.7 (6" HMI) to access the HMI remotely. Use '100' for password when prompted.

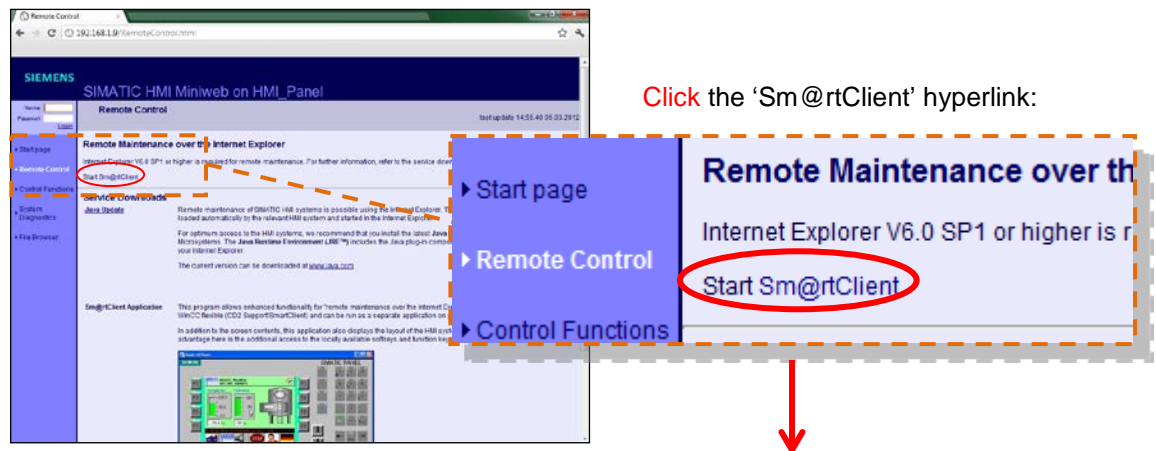


### 19.2.2 Connect PC to the FX2 accessible network

Open Internet Explorer browser and enter FX2 IP Address 192.168.1.9 (10" HMI) or 192.168.1.7 (6" HMI) to access the HMI remotely. When connection to the HMI is established, the following utility screen will appear (note: a JAVA browser plug-in update or installation may be required during the connection process):

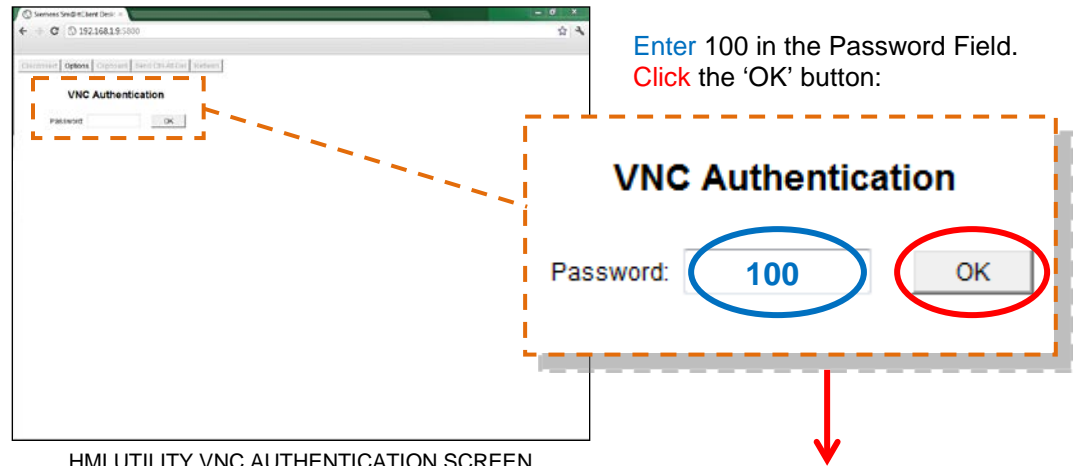


HMI UTILITY START SCREEN  
IN BROWSER WINDOW

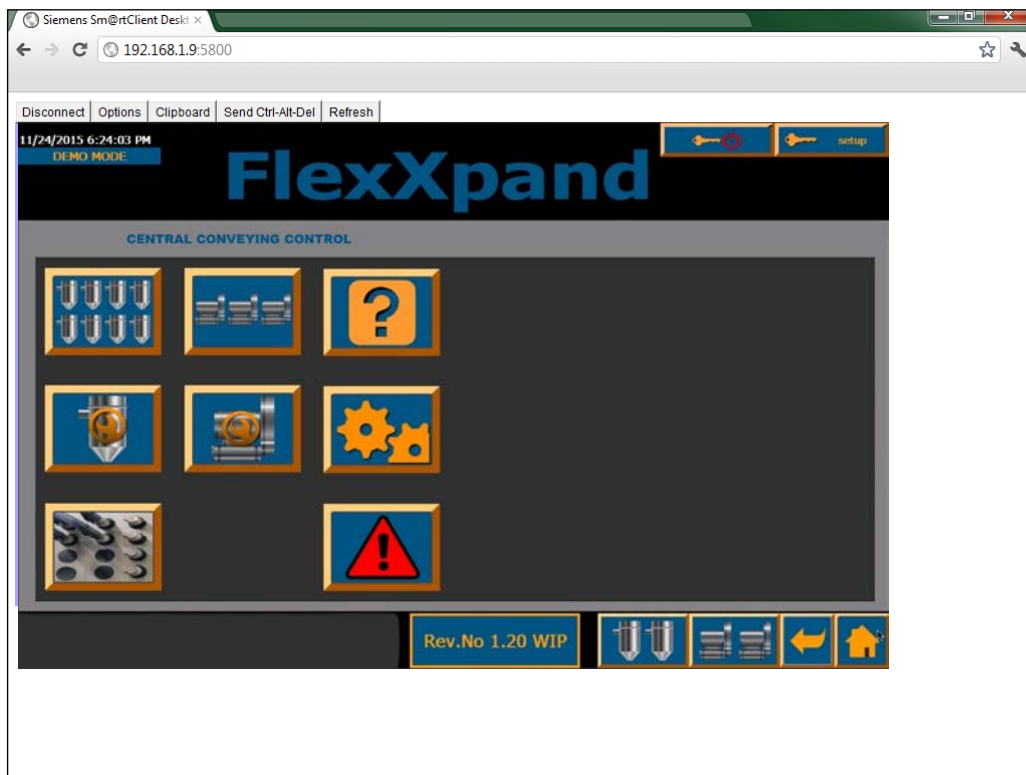


HMI UTILITY REMOTE CONTROL SCREEN  
IN BROWSER WINDOW

### 19.2.2 Connect PC to the FX2 accessible network (cont.'d)



HMI UTILITY VNC AUTHENTICATION SCREEN  
IN BROWSER WINDOW



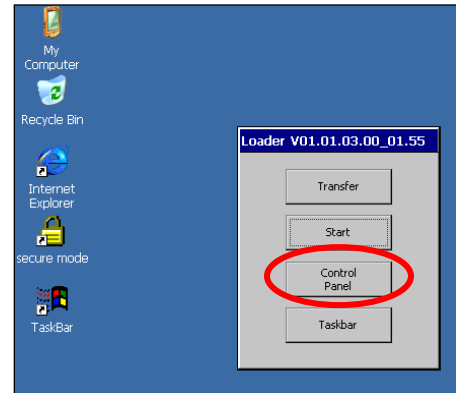
FX2 HMI SCREEN IN BROWSER WINDOW



## 19.3 HMI Setup Functions

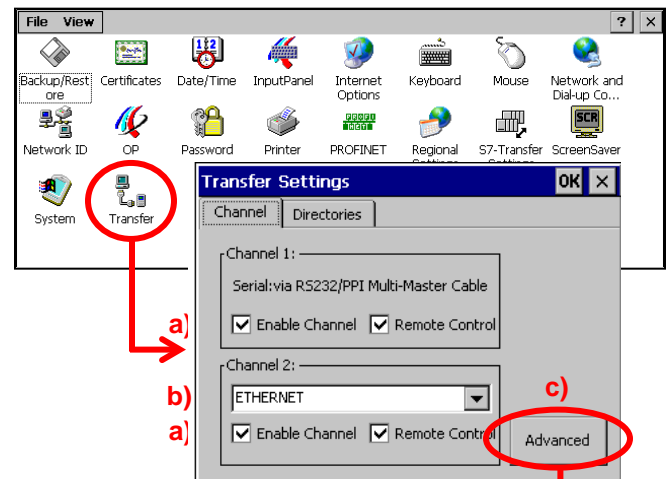
### 19.3.1 Accessing the HMI Operating System Utility

Power up the FX2 control. During HMI boot sequence (approximately 20 – 40 seconds), the operating system 'desktop' screen appears for approximately 5 seconds. Press or click the CONTROL PANEL button.

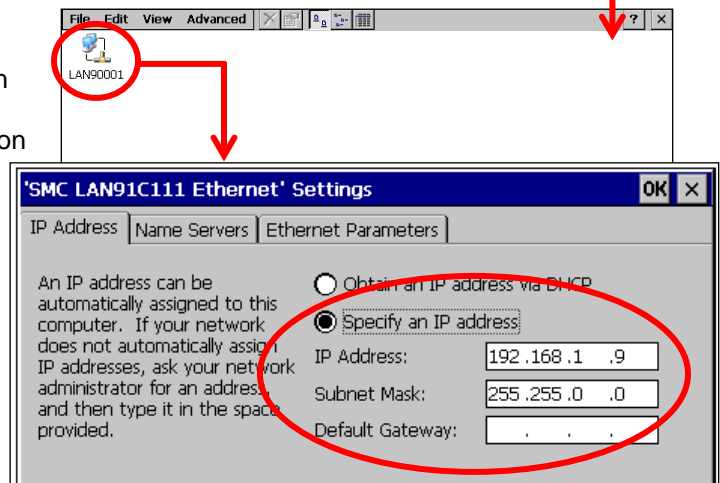


### 19.3.2 HMI Setup: Remote Access and Subnet Mask / IP Address

- At the HMI Control Panel screen, double press or click the TRANSFER button. In the Transfer Settings dialog box:
  - Verify 'Enable Channel' and 'Remote Control' boxes are checked for Channel 2.
  - Verify Channel 2 pull down selection is set to ETHERNET.
  - Press or click the 'ADVANCED' button.



- At the Advanced Transfer Settings screen, double click (press) the LAN9001 button. In the Ethernet Settings dialog box, click or press the 'Specify an IP address' radio button and set the Subnet Mask to permit access from your corporate network.



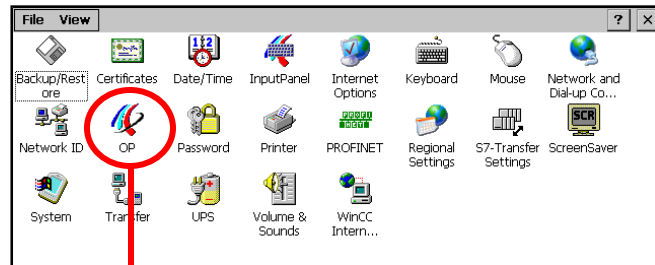
#### NOTES:

- Do not change the HMI IP Address. Loss of communication with the PLC will result.
- If IP Address conflicts exist between the Novatec Network and the corporate network, or their IP address schemes do not permit direct communication, a managed router will be needed to bridge the networks.



### 19.3.3 HMI Setup: Brightness and Touch Calibration

At the HMI Control Panel screen, **double click or press** the OP button.  
(see Section 11.3.1 for instructions to access the HMI Control Panel screen)

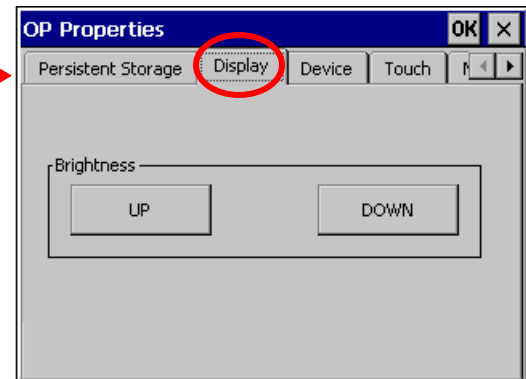


#### BRIGHTNESS

In the OP Properties dialog box, **click or press** the 'Display' tab.

**Click or press** the Brightness UP and DOWN buttons to adjust display appearance for ambient lighting conditions.

**Click or press** the OK button to close the OP Properties dialog box.

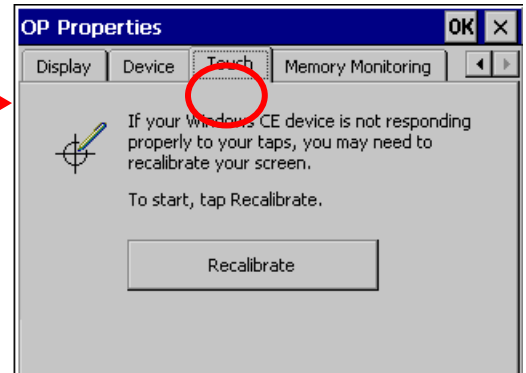


#### TOUCH CALIBRATION

In the OP Properties dialog box, **click or press** the 'TOUCH' tab.

**Click or press** the RECALIBRATE button and follow the on-screen prompts to sync the screen reaction to user touch taps.

**Click or press** the OK button to close the OP Properties dialog box.



## 20.0 MAINTENANCE

It is recommended that maintenance and inspection be performed on a scheduled basis. Maintenance requirements may vary widely for each installation and specific operating conditions. It is suggested that a complete inspection be performed with necessary maintenance at the end of the first month, the first three months, and the first six months. These inspections will indicate how often future maintenance will be necessary.

- ☐ All electrical, mechanical repairs and tests are to be performed by qualified personnel only.
- ☐ Disconnect electric power from control box before opening panel for maintenance.
- ☐ Depressurize pneumatic system before performing maintenance or repairs on pressure containing components. Check all pressure gauges to ensure that depressurization has occurred.
- ☐ Uninsulated dryer, hopper, and heater surfaces may be in excess of 150°F during heating. Allow the system to cool completely before beginning repair work.
- ☐ Do not disable or bypass equipment safety features.
- ☐ Refer to system component manuals for additional information.
- ☐ To prevent equipment malfunction and improper material delivery, do not manually force actuated valves (i.e. Station Valves, Purge Valves, Proportioning Valves, etc.) to the open or closed position during system operation.



**WARNING:** Before beginning repair work, disconnect all power sources and secure against inadvertent reconnection.



**WARNING:** Auxiliary equipment may contain moving parts that may cut, crush, or otherwise injure personnel when safety/access covers are removed. Do not place hands or limbs in equipment during operation.

### At Startup

- ☐ Verify station and VP settings.
- ☐ Record equipment Serial Numbers and the MCS Controller program revision level.

### Monthly

- ☐ Check system for air leaks or flow obstructions and correct as required.

### Every 3 Months

- ☐ Check all electrical connections to make sure that they have not become loose, especially those connections at contactors, motor starters, and heater elements.

## 21.0 WARRANTY

NOVATEC, INC. offers COMPREHENSIVE PRODUCT WARRANTIES on all of our plastics auxiliary equipment. We warrant each NOVATEC manufactured product to be free from defects in materials and workmanship, under normal use and service for the periods listed under **“Warranty Periods”**. The obligation of Novatec, under this warranty, is limited to repairing or furnishing, without charge, a similar part to replace any part which fails under normal use due to a material or workmanship defect, within its respective warranty period. It is the purchaser's responsibility to provide Novatec with immediate written notice of any such suspected defect. Warranted replacement parts are billed and shipped freight pre-paid. The purchaser must return the suspect defective part, freight prepaid and with identifying documentation to receive full credit for the part returned. Novatec shall not be held liable for damages or delay caused by defects. No allowance will be made for repairs or alterations without the written consent or approval of Novatec.

Please note that we always strive to satisfy our customers in whatever manner is deemed most expedient to overcome any issues in connection with our equipment.

### **Warranty Periods:**

Note: All warranty periods commence with the shipment of the equipment to the customer.

The provisions in equipment specifications are descriptive, unless expressly stated as warranties. The liability of Novatec to the purchaser, except as to title, arising out of the supplying of the said equipment, or its use, whether based upon warranty, contract or negligence, shall not in any case exceed the cost of correcting defects in the equipment as herein provided. All such liability shall terminate upon the expiration of said warranty periods. Novatec shall not in any event be held liable for any special, indirect or consequential damages. Commodities not manufactured by Novatec are warranted and guaranteed to Novatec by the original manufacturer and then only to the extent that Novatec is able to enforce such warranty or guaranty. Novatec, Inc. has not authorized anyone to make any warranty or representation other than the warranty contained here. Non-payment of invoice beyond 90 days will invalidate the warranty. A renewed warranty can be purchased directly from Novatec.

### **5-Year (Except 1-Year on Non-Novatec Buy-Out Items)**

#### **Resin Drying to Include**

NovaWheel™ Dryers \*  
Dual Bed Dryers  
NovaDrier \*  
NDM-5 Membrane Dryer  
Gas-Fired Process Heaters  
Gas-Fired Regeneration Heaters  
Drying Hoppers  
Central Drying Hopper Assemblies  
Heater/Blower Units and Hot-Air Dryer  
Silo Dehumidifiers  
NovaVac Dryers \*  
Nitrogen NovaDriers (Nitro)  
DryTemp Plus

#### **Central System Controls to Include**

FlexTouch™ Series Controls  
FlexXpand™ Series Controls  
OptiFlex™ Series Controls  
PLC Communications Modules  
Greenboard Communications Modules  
LOGO! Mini PLC  
MCS-600 Series Controls – (Distributed I/O)  
MCS-400 Series Controls  
CL Silo Manager

#### **Moisture Measurement Equipment to Include**

MoistureMaster®

#### **PET Resin Crystallizers**

#### **Resin Blending and Feeding to Include**

WSB Blenders, MaxiBatch & Feeders \*  
Gaylord Sweeper Systems

#### **Downstream Extrusion Equipment to Include**

C and NC Bessemer Series Cutters  
NPS Bessemer Series Pullers  
NPC Mini Puller/Cutter  
All NS Series Servo Saws  
All Cooling and Vacuum Tanks Manufactured by Novatec

#### **Resin Conveying and Systems Components to Include**

GSL Series Vacuum Loaders  
GlassVu Loaders, Receivers and Hoppers  
VL/VLP Series Loaders  
VRH, VR, VR-FL & VRP Series Receivers  
Compressed Air Loaders  
AL-B Barrel Loader  
Cyclone Dust Collectors  
Conveying System Accessories  
Surge Bins  
Valves and Accessories  
Electronic Metal Separators  
Quick Select Manifolds  
Tilt Tables  
Filter Dust Collectors  
Drawer Magnets  
Velocity Control Valves

### **3-Year**

#### **Resin Conveying System Components to Include**

\*\* VPDB Vacuum Positive Displacement Pumps  
\*\* SVP Vacuum Pumps  
\*\* MVP Vacuum Pumps  
\*\* Railcar Unloading Systems

**\*\*5-Year Extended Warranty** - When a MachineSense® data plan is activated for products with \*\*, Novatec automatically extends the warranty to 5 years. The data plan must be activated within 60 days after product shipment, and remain active through the warranty period to maintain extended warranty eligibility. The first 6-months of data plan usage is free from Novatec.

### **1-Year**

Infrared Dryers  
UltraVac Vacuum Pumps

Vacuum Regenerative Blower Pumps  
Custom Equipment of any kind unless otherwise specified

**Exclusions:**

Routine maintenance/replacement parts are excluded from the warranty. These include, but are not limited to: hoses, desiccant, filters, filter elements, wiper seals, gaskets, dew point sensors, infrared lamps, motors, internal solenoids, fuses and motor brushes. Use with abrasive materials will void the warranty of any standard product. Wear resistant options may be available to extend usable service life with abrasive materials. Novatec reserves the right to limit the warranty if the customer installs replacement parts that do not meet the specifications of the original parts supplied by Novatec.

**\*Specific Exclusions:**

1. NovaDrier<sup>™</sup> and NITROdry<sup>™</sup> warranty is void if coalescing filters are not replaced on a 6-month or yearly basis (per instruction manual) and/or membrane has been exposed to ozone.
2. NovaVac Dryer -The ability of the canisters to hold vacuum will be compromised if the vacuum seal edge is damaged from mishandling. We do not warranty canisters damaged from improper handling. We do, however, warranty the seals.
3. LOAD CELLS on our WSB's are covered by Novatec standard warranty as long as they have not been damaged from improper handling.
4. Desiccant Wheel Warranty will be void if the wheel has been exposed to plasticizer, dust or other contaminants as a result of negligence on the part of the processor.
5. DryTemp+ - We assume no responsibility from equipment failures resulting from untreated or improperly treated water.

**This warranty shall not apply to equipment:**


1. Repaired or altered without written approval of NOVATEC unless such repair or alteration was, in our judgment, not responsible for the failure
2. Which has been subject to misuse, negligence, accident or incorrect wiring by others
3. Warranty is void if processing rates exceed manufacturer-recommended levels or if damage is caused by ineffective power isolation and/or power spikes/sags or incorrect installation.


NOTE: All conditions and content of this warranty are subject to changes without notice.

**FX2 Addendum – LU 10 Ultrasonic Level Control Setup**

(Note: Also for LU 02 Silo Level Control)

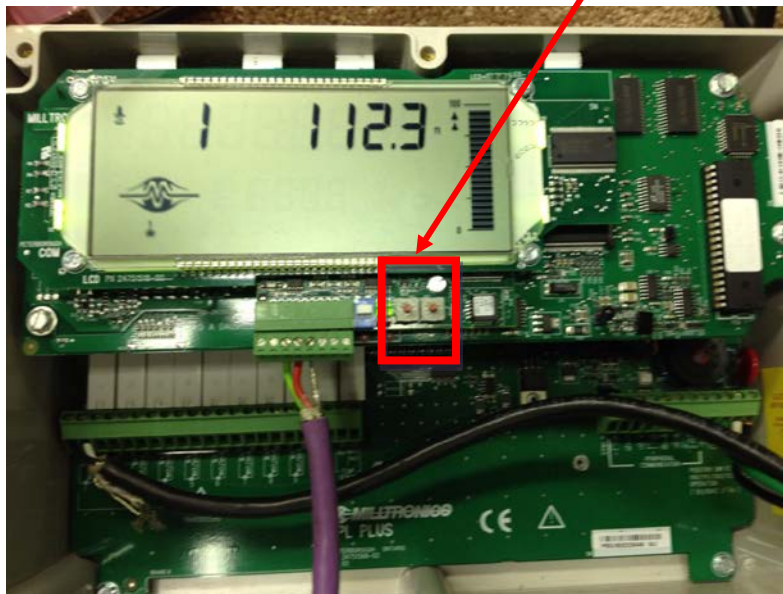
**22.0 APPENDIX 1 – ULTRASONIC LEVEL INDICATOR CONTROL PANEL STARTUP**

In RUN MODE you can VIEW ANY PARAMETER as an auxiliary display by pressing  and entering the 3-digit parameter desired. This will be displayed as an auxiliary number below the main displayed parameter.

QUICK BUTTONS are available such as distance from the transducer face to the level of the material by pressing the  button.

**LU 10 PROFIBUS COMMUNICATIONS SETUP**

1. Clear LU 10 memory P999 with 00 for index, then press C and then enter (not simultaneously)
2. Set Comm parameters for Profibus.
  - a. P794 = 1
  - b. P795 = 0
3. Set address on Profibus (add-on) module dials to 59.



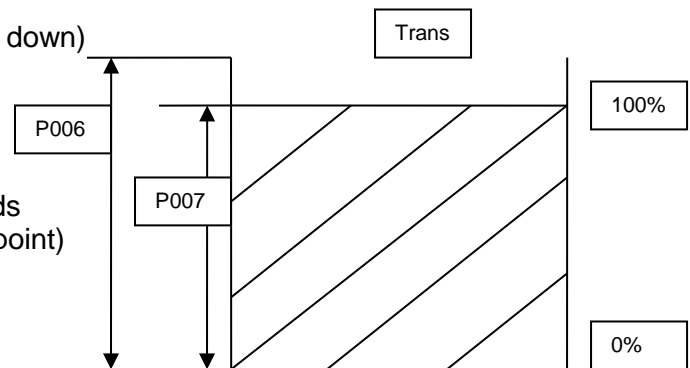
**FX2 Addendum – LU 10 Ultrasonic Level Control Setup**

**LU 10 GENERAL STARTUP:**

1. Hit the 12 block /keypad button. Screen should go blank except that icon.
2. Hit the circle arrow button. Screen should switch to programming mode (PXXX at the bottom)
3. **P001**- How the unit is measuring
  - a. 1 = Level (reading from the bottom up)
  - b. 2 = Space (reading from the span set point down)
  - c. 3 = Distance (reading from the face of the transducer down)
4. **P002** – What is the unit measuring?
  - a. 1 = Liquid
  - b. 2 = Solid
5. **P003** – How fast the material will be changing
  - a. 1 = 1 Slow (.1 m/min)
  - b. 2 = Medium (1m/min)
  - c. 3 = 3 Fast (10 m/min)
6. **P004** – What transducer is attached
  - a. 100 = ST-H
  - b. 102 = XPS-10
  - c. 104 = XPS-15
  - d. 105 = XPS-30
  - e. 112 = XRS-5
7. **P005** – Units of measure
  - a. 4 = Feet
  - b. 5 = Inches
8. **P006** – Empty distance  
(From the face of the transducer down)  
Customer Silo Measurement:  
Enter here:
9. **P007** – Span distance  
(from the empty distance upwards  
to what you want as your high point)  
Customer Silo Measurement:  
Enter here:

**INSTRUCTION NOTE:**

Yellow highlighted parameter values indicate typical settings. If you have questions regarding your parameter setup, please contact Novatec, Inc.



**P006 and P007 Diagram**

NOTE: P006 and P007 will need fine tuning for EACH setup.

**LEVELSETUP for P006 & P007:**

*Recommended:*

P006 = distance to bottom of silo straight wall.

*Alternate Setup:*

P006 = distance to silo discharge flange.

SEE VOLUME PARAMETERS P050 AND P052 FOR DETAILS.



**FX2 Addendum – LU 10 Ultrasonic Level Control Setup**

# **Volume Parameters (P050 to P055)**

If Readings proportional to volume are desired, adjust the following parameters.

**If Volume Conversion is not required, proceed to Reading Parameters.**

## **P050 TANK SHAPE**

Enter the Tank Shape option that matches the vessel monitored.

If the Tank Shape option selected requires additional vessel dimension entry, the **associated parameters** (as indicated below) may be scroll accessed.

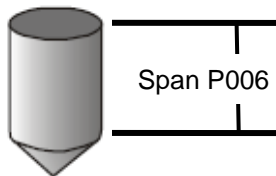
When Operation is "level" (P001 = 1), material volume is calculated. Alternatively, when Operation is "space" (P001 = 2), remaining vessel capacity is calculated.

In the RUN mode, Readings are displayed in percent of (and mA outputs are proportional to) maximum volume. To convert Readings to volumetric units, see Max Volume (P051).

When monitoring solids, volume calculation accuracy may vary.

values: 0 = volume calculation not required (preset)

Volume Calculation Disabled



**P050 = 0; (P052 = 0)**

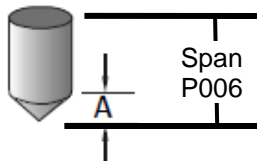
**Recommended Setup**

Use when Span (P006) is measured to the bottom of the silo straight wall section (ie: top of silo cone).

A Level value equal to 'zero' corresponds to the bottom of the straight wall (ie: top of silo cone).

*This is the reliable measurement range for XPS Ultrasonic Transducers.*

cone / pyramid bottom (P052)



**P050 = 2; (P052 = Cone Height)**

**Alternate Setup**

Use when Span (P006) is measured to the silo bottom discharge opening.

A Level value equal to 'zero' corresponds to the silo discharge and approximates actual volume.

**CAUTION:** XPS Ultrasonic Transducers cannot read accurately to the bottom of the silo cone. Set software 'low alarm' to identify reliable sensing range threshold (ie: top of silo cone).

## **P052 TANK DIMENSION A**

Enter the height of the tank bottom if P050 = 2,3,4, or 5, or the length of one end section of the tank if P050 = 7, in Units (P005).

values: 0.000 to 9999 **Feet**

**FX2 Addendum – LU 10 Ultrasonic Level Control Setup**

**P051      MAX VOLUME**

Use this feature to display the Reading in volumetric units rather than percent.

Enter the vessel volume between Empty (P006) and Span (P007).

e.g. 1      If the volume = 3650 m<sup>3</sup>, enter 3650.

e.g. 2      If the volume = 267,500 U.S. gallons, enter 267.5 (1000's of gallons).

values: 0.000 to 9999

## FX2 Addendum – LU 10 Ultrasonic Level Control Setup

### TRANSDUCER AIMING AND CONTROL SETUP:

While in program mode hit the circle arrow button. Whatever parameter you are looking

#### **Best Practice:**

Three steps are needed to ensure accurate readings based on setup.

- Full Silo
  - Aim Easy Aimer to receive the best signal through P805 and P806 on LU 10.
  - Mark Easy Aimer
- ½ Empty Silo
  - Aim Easy Aimer to receive the best signal through P805 and P806 on LU 10.
  - Mark Easy Aimer
- Nearly Empty Silo
  - Aim Easy Aimer to receive the best signal through P805 and P806 on LU 10.
  - Mark Easy Aimer



Between the three marks on the easy aimer is the best range for the setup. Depending on what the customer would like to base their readings off of, set Easy Aimer to that setting.

**NOTE:** During startup, Novatec aims to current level of material.

During the aiming process, you must check the following parameters to ensure valid aiming direction:

1. P805 - Echo Confidence {# : #}
 

{Short Echo: Long Echo}

  - a. Access this Parameter in the run mode by pressing the  button and entering 805. If in the program mode you must press  to activate an evaluation.
  - b. **Short Echo**
    - i. Should be 0.
    - ii. If this is not 0 look at near blanking prior to calling Siemens.
  - c. **Long Echo**
    - i. Should be as high as possible.
    - ii. This parameter goes up to 99. However, you may find highest you can get is 10-15.
    - iii. If this number is lower than that, check P804 which is normally preset.
      1. Lower P804 upon discussion with Siemens
2. P806 -Echo Strength
  - a. Serves as directional feedback.
  - b. If P806 goes *down* as P805 goes *up* contact Siemens
3. P807 - Noise
  - a. Should be as low as possible
  - b. Should NOT change with aiming
  - c. Range -99 → 99 with 0 being “low”
  - d. Left hand number should be below 20, negative numbers are okay.

### **FX2 Addendum – LU 10 Ultrasonic Level Control Setup**

NOTE: If you experience difficulty obtaining acceptable values for P805, P806 or P807, the following parameters may be of assistance:

NOTE: If you experience difficulty obtaining acceptable values for P805, P806 or P807, the following parameters may be of assistance:

1. **P800 - Near Blanking – IF MATERIAL IS INSIDE BLANKING DISTANCE, ERRATIC READINGS WILL BE SEEN.**
  - a. Use this feature if the material level is incorrectly reported to be near the transducer face
  - b. Ignores obstructions within a certain distance of Transducer
  - c. XPS 15&30 preset to ~2 ft

Extend Near Blanking to overcome measurement difficulties which cannot be corrected by transducer location mounting or aiming.

The causes of measurement difficulties which may be corrected include:

- A vessel obstruction partly blocking the transducer acoustic beam
- A transducer stand pipe mount that is too narrow for its length
- A transducer mounting which is resonant at the transducer frequency

2. **P801 – RANGE EXTENSION (values: 0.000 to 9999)**

Use this feature if an incorrect level is reported (when material level is lower than Empty, P006).

Range Extension is the distance (in Units (P005) or % of Span (P007)) beyond 'Empty' which is still ultrasonically measurable.

If Empty is substantially higher than the actual vessel bottom, increase Range Extension such that Empty plus Range Extension is greater than the transducer to vessel bottom distance.

This value is automatically preset to 20% of Span (P007).

**FX2 Addendum – LU 10 Ultrasonic Level Control Setup**

**IMPORTANT PARAMETERS:**

	Silo 1	Silo 2	Silo 3	Silo 4	Silo 5	Silo 6	Silo 7	Silo 8	Silo 9	Silo 10	Silo 11	Silo 12
P001	1	1	1	1	1	1	1	1	1	1	1	1
P002	2	2	2	2	2	2	2	2	2	2	2	2
P003	2	2	2	2	2	2	2	2	2	2	2	2
P004												
P005	4	4	4	4	4	4	4	4	4	4	4	4
Empty P006												
Span P007												
P050												
P052												
P201	1	1	1	1	1	1	1	1	1	1	1	1
P800												
P801												
P805												
P806												
P807												

Level  
Solid Material  
Medium Response  
XPS-15 = 104  
XPS-30 = 105  
Unit of Meas.  
Feet  
**Dist: Bottom of transducer to Empty Level**  
**Dist: Empty Level to Full Level**  
'0' OR '2'  
See p.36  
Based on P050  
See p.36  
Automatically Set (P001 & P050)  
Near Blanking.  
Automatically Set for XPS15-30  
Range Extension.  
Default = 20% of Span.  
Record for reference  
Record for reference  
Record for reference

**Novatec FX2 (Novatec access level)**

Scaling Factor (Gain)

Silo 1	
Silo 2	
Silo 3	
Silo 4	
Silo 5	
Silo 6	
Silo 7	
Silo 8	
Silo 9	
Silo 10	
Silo 11	
Silo 12	

Calculated by:

If Gain = 1, Level = %; If Gain >1, Level = (Gain) x 9999

Fill out necessary parameters to provide an "At Start-up Reference" for customer and Novatec in the event parameters are inadvertently changed at a later date. This will also help future troubleshooting.







## 23.0 APPENDIX 2 – CONVEYING SYSTEM TROUBLESHOOTING

### System Component Operation Details

#### 1. VACUUM T VALVE OPERATION

Each vacuum receiver in the conveying system is coupled to a vacuum “T” valve that isolates the vacuum conveying power of the pump to one receiver at a time for conveying. Each T valve in the system must close off air flow when it is NOT in operation, allowing other receivers to receive full vacuum. One ‘stuck’ valve can ruin the vacuum supply for the entire system. Check that each valve operates in response to its receiver’s turn in the vacuum system. Each valve should open for loading and close when loading is complete. The extended shaft of the valve’s cylinder is a good indication of valve operation.

**Rule of thumb:** *If only one receiver in the system is conveying correctly, it is probably that receiver’s T valve that is not closing properly.*

#### 2. RECEIVER DISCHARGE FLAPPER STUCK OPEN

*The flapper valve at the base of the receiver provides three critical functions:*

- Seal off the base of the receiver, creating a sealed vacuum chamber and allowing it to load,
- Open reliably to allow material to empty out and
- Signal the conveying control system of the need for more material (when it swings shut, by its own weight).

*If the flapper valve is stuck open or does not fully close, conveying cannot take place. A problem receiver can be easily checked for proper, free movement of its flapper valve:*

- If conveying is not triggered when the flapper is closed, there is an issue with the electrical demand switch.
- If the flapper does not swing nearly shut by its own weight, there is a pivot point (hinge) or counterweight issue.
- If the flapper is ‘stuck’ in the open position, there is a material contamination issue with the pivot point (hinge) of the valve and it must be cleaned and examined for wear. Contamination of the hinge is typically caused by material, finding its way into the pivot point, but in older receivers, may also be a metal burr that has formed from age.

#### 3. RECEIVER INLET CHECK VALVE STUCK OPEN

Many receivers are equipped with swinging check valves on their material inlets. Check valves provide a variety of useful functions for system operation and are pushed open when material is conveyed into the receiver. But on systems that convey material from one source to multiple receivers, each check valve in the system must seal to allow the one receiver being loaded to receive the full vacuum force from the conveying pump. A check valve that is stuck open, either by hinge wear or a trapped pellet, will leak valuable vacuum air through that receiver while others try to fill. This decreases vacuum air at the source which can prevent conveying throughout the system. If the leakage is severe, material can even be pulled from the leaking receiver and delivered to another receiver.

**Rule of thumb:** *On systems that convey material from one source to multiple receivers via a common material line; If only one receiver in the system conveys correctly, it is probably that receiver’s check valve that is not closing properly.*

#### 4. CONVEYING CONTROLS NOT PROPERLY (RE) PROGRAMMED

Central material conveying systems that include a network of pumps, receivers and material sources provide high efficiency and a multitude of flexibility. But often, new requirements are not completely programmed after material or system configuration changes. Items to check:

- Is the new material source further away than the previous source? More conveying time and/or purge time might be required to accommodate this difference in distance.

- Is the new material as free-flowing as the last material? Does the material have a tendency to clog the conveying lines, or simply convey slower due to weight or shape? Changes to load/purge times as well as material pick-up tube changes may be required.
- Has the receiver been assigned to the proper vacuum pump? The proper material valve?
- Has system piping and or wiring been modified to accommodate this new configuration for conveying?

## 5. VACCUUM PUMP - VACUUM BREAKER VALVE OPERATION

Located on the central vacuum pump of the system, the vacuum breaker valve allows ambient air to be drawn into the pump when the conveying system is NOT conveying. This function prevents rapid re-starts and stops of the pump during the “seek” time of the loading control, cools the pump and prevents the over loads in the pump starter from over heating. But the pneumatically-operated breaker valve must close and seal when the vacuum system is conveying material, directing all vacuum force to the job of conveying. Check the following:

- The valve is connected to a reliable source of clean compressed air, which is turned on. Air pressure should be 85-120 psi.
- The valve must not be leaking vacuum air. Often a sucking sound can be heard, indicating the valve is not sealing properly.
- View the level of vacuum created by the pump on its vacuum gage while attempting to convey material: Although the reading on this gauge will vary greatly depending upon your system configuration, it is a valuable tool for assessing system operation and discovering faults. Vacuum levels below 6” indicate a breaker valve fault or other problems in the vacuum system.

## 6. YOUR MATERIAL SOURCE

Common gaylord box issues are:

- Rat-holing: The feed tube has sucked up all the free-flowing material around its pick-up end and the material must now be stirred to allow material to flow into the feed tube again. A Gaylord tilter may be helpful in this situation.
- Bag liner line plugging: The feed tube has sucked in the thin film lining of the gaylord, blocking off material flow to the receiver.
- Feed tube fell out of the box: By weight of its own hose, or by vibration of the flex hose while conveying.
- Out of material: Time to move in a new gaylord.

Common material selection issues:

- Conveying line connected to the wrong source of material.
- Wrong purge valve selected: If a purge valve is used at the material source, it must be programmed by the system control to operate in conjunction with a specific receiver. Material changes require making a new valve selection at the system control.
- Purge valve is not operating: If a purge valve is used at the material source, it must be energized to allow material loading (and de-energized for purging). A fault at this valve, IE: lost compressed air connection, an open purge valve access door or a material jammed purge valve will prevent material movement.

## 7. FEED TUBE / TAKE-AWAY BOX AIR SETTINGS

The conveying of material by air cannot be accomplished without air movement. Regardless of the type of pickup device being used; purge valve, wand, take-off box, etc.... these devices must be adjusted to allow the introduction of material and air, in a mixture suitable for conveying the specific material the distance required. Typically, the probe should be at least 50% open to avoid plugging the material line.

## System Control Operation – Station Conveying Timer Setup

Once the timers are set to give the maximum amount of material, per load, in the vacuum chamber without overfilling it, they should not be changed.

**Exceptions:** When going from a source farther from the point of usage to a source nearer the point of usage. (Or vice versa) Load time will be changed accordingly. For Purge systems, the Purge time will change but the Load time may not change.

(Increase or decrease accordingly)

### Basic Startup / Troubleshooting Checklist - Receiver

- 1) Is the station turned on? Verify at the controller.
- 2) Is the Vacuum line physically attached to this station?
- 3) If using source valves, is the proper valve is assigned to this station? (Station Source Assignment)
- 4) Is the source valve opening and closing properly?
- 5) Check the air probe at the source – is it at least 50% open. The system cannot move material without air mixed in with the material flow.
  - If the material line plugs when no leaks are present and the probe air adjustment is 100% open, partially close the hopper slide gate to limit material flow into the conveying line.
- 6) Are there holes or breaks in any material or vacuum hoses?
- 7) Is the material flowing freely from the source?
  - Is it clogged in the hopper or receiver discharge?
  - Is the material source empty or full?
  - Is material clogged in the line?
- 8) Is the receiver flapper sealing properly against the discharge tube? Is the gasket installed (5" dump throat only)?

### Basic Startup / Troubleshooting Checklist - Vacuum Pump

- 1) Check direction of rotation of the pump motor.
- 2) Check amperage draws; check continuity of legs on the motor.
- 3) Check belts for wear and tear.
- 4) Check blower for wear and tear. Check for any bearing play.
- 5) Check oil level in the blower. Replace if necessary per PM instructions.
- 6) To check vacuum in the system:
  - a) Remove vacuum line from inlet to the cyclone.
  - b) Cap off the cyclone inlet (use duct tape, or simply cover it with a rigid, flat object (wood, sheet metal, etc.).
  - c) Manually start the pump by pushing in the motor starter. The high vacuum relief should open. This will let you know the pump is sealed properly. The vacuum gauge should go to maximum inches HG for the pump (see pump instruction manual).
    - If the vacuum relief doesn't open, there is an air leak at the pump. Check the seal on the dump can on the cyclone, the filter housing lid seal at the pump, the vacuum breaker valve, (verify it has air 85 to 100 psi), and all piping connections.
  - d) If the relief valve opens, reconnect the vacuum line to the system and perform the same check. If the relief valve opens, the system is sealed and all station vacuum valves are closed.
    - If the valve doesn't open, you have a vacuum leak and the system has to be checked for any open lines, station valves open, or no air to the station vacuum valves.
- 7) Check the vacuum while the system is conveying material. The pump vacuum gauge should read between 4" Hg vacuum up 1" Hg less than the pump relief point. Typically, vacuum < 4" Hg indicates a vacuum leak or no movement of material. Vacuum > relief point means the line is clogged:
  - Too much material is in the conveying line without the proper air mixture.
  - Stations are being overfilled.
  - The filter on the vacuum chamber or at the pump may be clogged.
  - The station vacuum valve may not be opening.