

SubDrive Connect Plus

Physical Installation

Environmental Requirements

NOTICE

Risk of damage to drive, or malfunction can occur due to improper handling, installation, or environment.

- Install in a location where temperature is within the range of product rating.
- Mount VFD vertically (top up) for proper heat dissipation.
- Do not mount VFD in direct sunlight or near other heat sources.
- Do not install in corrosive environments.
- Install away from direct sunlight and extreme temperatures or humidity.
- Installation of non-approved screening may damage the drive and/or reduce output.

The drive is intended for operation in ambient temperatures from -13 °F to 122 °F (-25 °C to 50 °C).

- Allow at least 6 inches (15.24 cm) of clearance on all sides of the unit for air flow.

The drive is suitable for outdoor use with a NEMA 3R rating, provided:

- **Mount the drive on a back plate 6" (15 cm) larger than the outer dimensions of the enclosure in order to maintain the NEMA 3R rating.**
- The unit must be mounted vertically with the wiring end oriented downward, and the cover must be properly secured (also applies to indoor installations).
- NEMA 3R enclosures are capable of withstanding downward-directed rain only. Protect from hose-directed or sprayed water as well as blowing rain.

Mounting the Drive

1. Mount the drive using all three keyhole slots on the top side of the enclosure.
2. At least two keyhole screws at the top must attach to a solid structure such as a stud or brace.
3. Secure the three additional mounting holes on the bottom.
4. All six screw hole locations should be used to ensure the drive is securely mounted.

IMPORTANT: Do not drill holes in the drive.

CAUTION

Risk of bodily injury or damage to drive or other equipment.

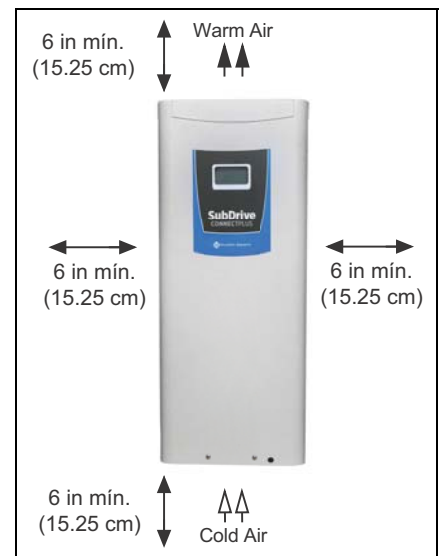
- The drive should be mounted on a structure such as a wall or post capable of supporting the weight of the unit, at least 18" (45.7 cm) above the ground.
- The drive must be mounted on a heat-resistant back plate.
- Ensure suitable mounting hardware is used when installing the drive.
- Do not install the drive on unreinforced drywall.
- Use two persons when lifting the drive for transport or installation. If using lifting equipment, it must be in good condition and rated for at least 5 times the weight of the drive.
- Wear protective gloves while installing the drive to guard against sharp edges.

This **QuickStart Guide** includes basic installation, setup, and operation information.

For additional important safety and operation information, please refer to the

SubDrive Connect Plus Owner's Manual and the **AIM Manual** available at:

www.franklinwater.com.



Electrical Installation

Wiring Guidelines

NOTICE

Risk of damage to VFD, or malfunction can occur.

Follow all wire routing and grounding instructions carefully. Inductive currents caused by parallel wiring, or close proximity between high voltage and control wiring can cause unexpected behaviors.

- Do not run input power and motor wires in the same conduit.
- Do not run motor wires from multiple VFDs in common conduit.
- Do not run any wiring through the airflow channel in the back of the drive.
- Do not run control wiring parallel with high voltage wiring.
- Do not install a magnetic contactor or disconnect in the motor circuit.
- Do not run VFD wiring parallel with house or out-building wiring.
- Do not use aluminum wires for VFD connections.
- Do not use with a Ground Fault Circuit Interrupter (GFCI).
- All wiring must comply with the National Electrical Code and local codes.
- Improper splicing or damage to motor cable insulation may expose the conductor(s) to moisture and can produce motor cable failure.
- For retrofit application, make sure to check the integrity of power and motor leads. This requires measuring the insulation resistance with a suitable megohm-meter.

1. Wire directly to the service entrance. Do not connect to a sub-panel.
2. Use a dedicated branch circuit for the drive.
3. Route motor wiring out of the building as soon as possible. Separate input power and motor wiring by at least 8 in. (20.3 cm).
4. Cross over other branch circuits and facility wiring at a 90° angle. If it is necessary to run wiring in parallel, separate by at least 8 in. (20.3 cm).
5. All control wiring—sensors, switches, transducers, etc.—should be in a separate conduit routed individually, not parallel, from high voltage wiring. In addition, any shielded cables should be properly grounded.

Branch Circuit Protection

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes, or the equivalent. Drive shall be protected by fast-acting Class T fuses only.

Terminal Block Wire Size

Frame Size	Input Terminal Block SDC Plus All Models		Output Terminal Block SDC Plus SUB Models		Output Terminal Block SDC Plus CEN Models	
	Min AWG	Max AWG	Min AWG	Max AWG	Min AWG	Max AWG
Frame 2	20	6	20	2	20	6
Frame 3	20	2	16	2/0	20	2

Maximum Torque

Do not use power tools to tighten terminal block screws, use hand tools only. Tighten terminal block screws to a maximum torque of:

- AWG 20 to AWG 6 - 15 in-lbs (1.7 Nm)
- AWG 20 to AWG 2 - 31 in-lbs (3.5 Nm)
- AWG 16 to AWG 2/0 - 50 in-lbs (5.5 Nm)

Power Wiring Connections

⚠ WARNING



Contact with hazardous voltage could result in death or serious injury.

- Disconnect and lock out all power before installing or servicing equipment.
- Connect the motor, the drive, metal plumbing, and all other metal near the motor or cable to the power supply ground terminal using wire no smaller than motor cable wires.
- Close any open conduit holes before finishing installation.

NOTICE

Risk of damage to drive, or malfunction can occur.

- Power source line to line, and line to ground voltages must be measured before connecting the drive. If line to ground voltage exceeds specification, both pins of EMC jumper J10 must be removed to prevent damage to the drive. Refer to “Incoming Power Supply” below.
- Ensure that the system is properly grounded all the way to the service entrance panel. Improper grounding may result in loss of voltage surge protection and interference filtering.

Incoming Power Supply

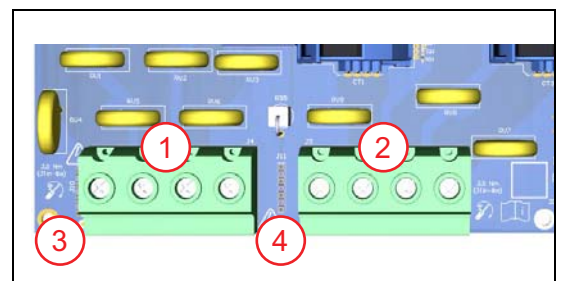
Before connecting power to drive, test incoming voltages as follows:

- **230V Models:** The line to line and line to ground voltage must be 190-253V (208-230V $\pm 10\%$). The line to ground voltage must be less than or equal to 253 V.
- **460V Models:** The line to line and line to ground voltage must be 414-506V (460V $\pm 10\%$). The line to ground voltage must be less than or equal to 506 V.

If line to line voltage exceeds these ratings, the drive cannot be used on the incoming power supply. An additional suitably sized transformer will be required to bring the voltages within limits.

IMPORTANT: If line to ground voltage exceeds these ratings, remove Power Board EMC jumpers from J10 and J11 (four total). This is common in applications supplied by a Corner-Grounded Delta transformer. Refer to the NOTICE above.

1. Incoming Power terminal block.
2. Power Out to Motor terminal block. If the drive is equipped with a dV/dt (EMI) filter, this terminal block is pre-wired to the dV/dt filter. The motor is wired to the terminal block on the dV/dt filter.
3. J10 Jumper location (two jumpers here).
4. J11 Jumper location (two jumpers here).



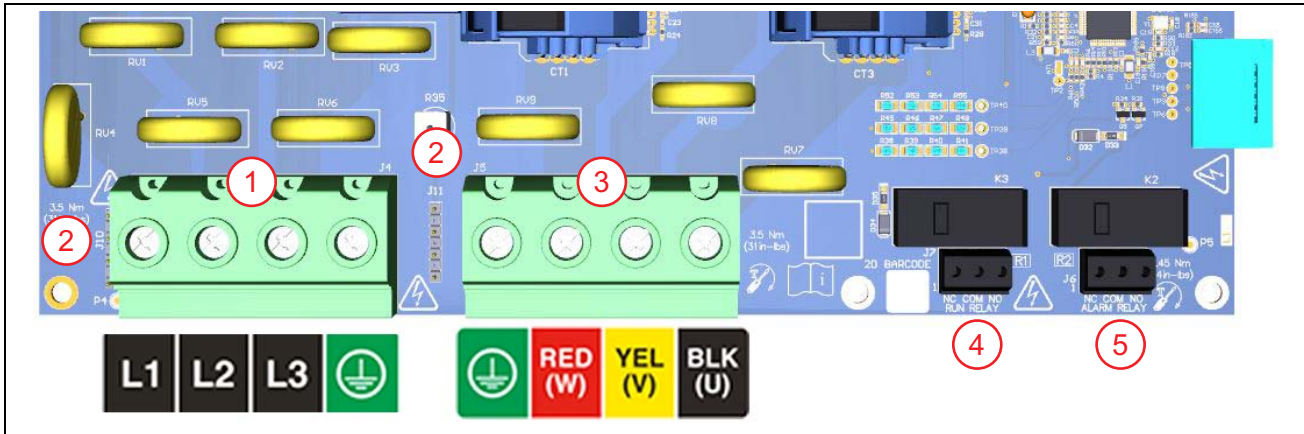
Ground Connections

1. Make sure a service entrance ground rod is properly installed and connected.
2. An input power ground wire from the supply panel must be connected to the drive.
3. A dedicated output ground wire from the drive must be connected to the motor. Motor and ground wires must be bundled together.

QUICKSTART GUIDE

Electrical Installation

Power Circuit and Motor Connections



NOTE: Do not use power tools to tighten these screws, use hand tools only. Refer to [“Maximum Torque” on page 2](#) for wire size and torque information.

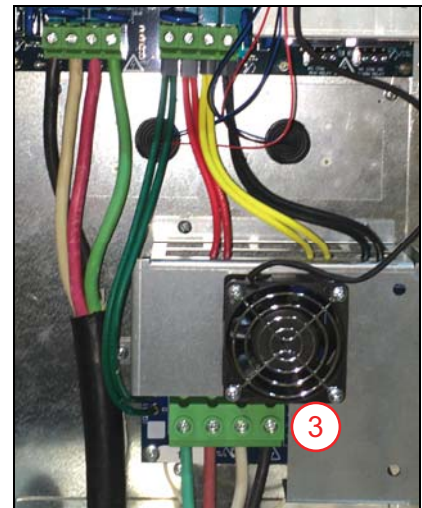
- Power Input Connector:** Remove one of the knockouts on the bottom left side of the drive. Route the incoming power leads through the opening on the bottom left side of the drive and connect them to the Power Board terminal block (#1 above).
 - Use positions marked L1, L2, and \oplus (Ground) for 230 VAC single-phase incoming power.
 - Use positions marked L1, L2, L3, and \oplus (Ground) for three-phase incoming power.
- J10, J11 EMC Jumper:** If any line to ground measurements exceed specification, these jumpers must be removed (four jumpers total). Refer to [“Incoming Power Supply” on page 3](#).
- Output to Motor:** Route the motor leads through the opening on the bottom center of the drive (large opening) and connect them to the terminal block (#3 above) positions marked \oplus (Ground), Red (W), Yellow (V), and Black (U).

For drives that include a dV/dt filter, motor connections are made at the terminal block on the left side of the dV/dt filter (#3 at right). In this case, the terminals are marked \oplus (Ground), Red (U), Yellow (V), and Black (W).

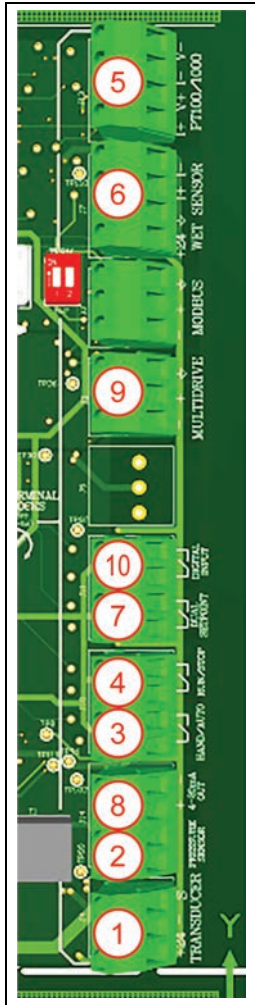
NOTE: Relay terminals accept wire sizes from 12 to 26 AWG and should be tightened to a torque of 3 in-lbs (0.35 Nm). Do not use power tools to tighten these screws, use hand tools only.

- System Run Relay:** This connection activates whenever the system is actively pumping. Both normally-open (NO) and normally-closed (NC) contacts are provided. The contacts are rated 5 A at 250 VAC/30 VDC for general purpose loads, or 2A at 250 VAC/30 VDC for inductive loads (i.e. relay).
- System Alarm Relay:** This connection activates whenever the system is faulted. Both normally-open (NO) and normally-closed (NC) contacts are provided. The contacts are rated 5A at 250VAC/30VDC for general purpose loads, or 2A at 250VAC/30VDC for inductive loads (i.e. relay).

NOTE: These relays are not suitable for use on low voltage isolated circuits, and not recommended to control critical systems (chemical dosing, etc.).



Control Circuit Connections



NOTE: All control terminals accept wire sizes from 12 to 26 AWG and should be tightened to a torque of 3 in-lbs (0.35 Nm) maximum. Do not use power tools to tighten these screws.

1. **Pressure Transducer** – When using a pressure transducer:
 - Connect the red cable lead to the TRANSDUCER +24 terminal.
 - Connect the black cable lead to the – terminal.
 - Connect the shield wire (when applicable) to the S terminal.

NOTE: An included 200 PSI transducer is included with the drive.
2. **Pressure Sensor** – When using a standard pressure sensor:
 - Connect the sensor leads (interchangeable) to the Pressure Sensor terminals.
3. **Hand/Auto Switch** – Connect a dry contact switch to this terminal to select Hand or Auto modes. In Auto mode (this terminal is open), the drive will regulate pressure. In Hand mode (terminal is closed), the drive will run at a fixed frequency. The frequency can be selected via the up/down buttons.
4. **Run/Stop Switch** – Connect a dry contact switch to this terminal to select Run or Stop modes. The drive will operate regularly when this terminal is open. The drive will stop the motor if this terminal is closed.

NOTE: When Stop is selected, the drive motor will stop even if the drive is in Auto mode.
5. **PT100/1000** – Connector for external RTD temperature sensor.
 - I+ Positive connection for excitation current circuit for two, three, and four wire PT100/PT1000 RTD sensors.
 - V+ Positive connection for voltage sensing circuit for two, three, and four wire PT100/PT1000 RTD sensors.
 - I-/V- Negative connections for the excitation and voltage sensing circuits for two, three, and four wire PT100/PT1000 RTD sensors.
6. **Moisture Sensor** – The WET SENSOR terminal supports the Franklin Electric Moisture Sensor.
 - Connect the red cable lead to the +24 terminal.
 - Connect the black cable lead to the \oplus terminal.
 - Connect the white cable lead to the I+ terminal.
 - Connect the green cable lead to the I- terminal.
7. **Dual Setpoint** – The drive will regulate to Pressure Setpoint 1 when this terminal is open. Pressure Setpoint 2 is active when this terminal is closed.
8. **Analog (4-20mA) Output** – The 4-20mA Analog Output allows the user to repeat the incoming Pressure Transducer 4-20mA signal. Additionally, DIP SW1 Position 4 can be toggled to output a 4-20mA signal of the motor speed.
9. **MultiDrive** – Setup in the mobile app only. Connections should be from each terminal to the corresponding terminal on the next drive(s) in series.
 - Shield wires should be connected together and grounded on one end only.
 - DIP Switch SW7 - Position 2 (to the left of the connector) should be in the **Up (On)** position for the first and last drives in the series.
10. **Digital Input** – This feature will be used in the future.

Drive Configuration

To adjust system settings, make sure power is off for five minutes, and remove the cover. Then, power the drive to make menu and DIP switch changes. When changes are complete, power off the drive before replacing the cover.

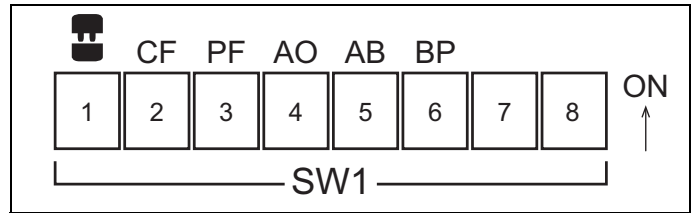
DIP Switch Settings

DIP switch changes can be made with the drive powered and will take effect immediately.

Basic Setup (DIP SW1 – Position 1)

DIP SW1 Position 1 (FE Connect mobile app switch) must be in the **OFF** (down) position for DIP switch settings to be recognized. If the switch is in the **ON** (up) position, the drive can be programmed using the SubDrive Connect Plus mobile app. This setting disables DIP switch control and app programming overrides any manual DIP switch settings. Refer to [“FE Connect Mobile App for SubDrive Connect Plus” on page 10](#) for more information.

NOTE: The menu-based settings can be changed regardless of the position of this DIP switch.



Carrier Frequency Switch (DIP SW1 – Position 2)

In CEN applications where audible electrical noise can be heard from the motor, increasing the carrier frequency (CF) can help reduce or eliminate audible electrical noise.

- Carrier frequency setting is 2.5 kHz when the switch is in the off (down) position.
- Carrier frequency setting is 8 kHz when the switch is in the on (up) position.

NOTE: SUB drive models (filtered drives) do not allow 8 kHz.

Pipe Fill Switch (DIP SW1 – Position 3)

When enabled, the Pipe Fill (PF) feature will run the motor at reduced speed while the pipes fill with water. This can reduce water hammer in some systems, building up pressure in a controlled manner.

- The Pipe Fill feature is disabled when the switch is in the off (down) position.
- The Pipe Fill feature is enabled when the switch is in the on (up) position.

NOTE: Additional configuration of the Pipe Fill feature is available in the SubDrive Connect Plus mobile app.

Analog Output Selection (DIP SW1 – Position 4)

Use this switch (AO) to select the signal to be repeated on the 4-20mA Output terminal.

- The analog output is proportional to the motor speed value when the switch is in the off (down) position.
- The analog output repeats the 4-20mA transducer reading when the switch is in the on (up) position.

Bump Mode Configuration (DIP SW1 – Position 5)

Bump mode controls how hard the drive will pump just before stopping the motor when the pressure setpoint is reached. For applications with a large pressure tank, or if the system takes too long to stop, place the switch in the **ON** (up) position for a more aggressive bump.

- Test system behavior to ensure proper operation.

NOTE: Additional configuration of the Bump Mode feature is available in the SubDrive Connect Plus mobile app.

Broken Pipe Protection (DIP SW1 – Position 6)

When enabled (in Auto mode only), this feature stops the system and displays a Fault condition if the drive runs at full speed for 10 minutes without reaching the pressure setpoint.

If the system is used with a sprinkler system or is being used to fill a pool or cistern, the feature should be disabled.

- The Broken Pipe fault is disabled when the switch is in the off (down) position.
- The Broken Pipe fault is enabled when the switch is in the on (up) position.

NOTE: Additional configuration of the Broken Pipe feature is available in the SubDrive Connect Plus mobile app.

Menu Settings

To adjust system settings, make sure power is off, and remove the cover. Then, power the drive to make menu changes. When changes are complete, power off the drive before replacing the cover.

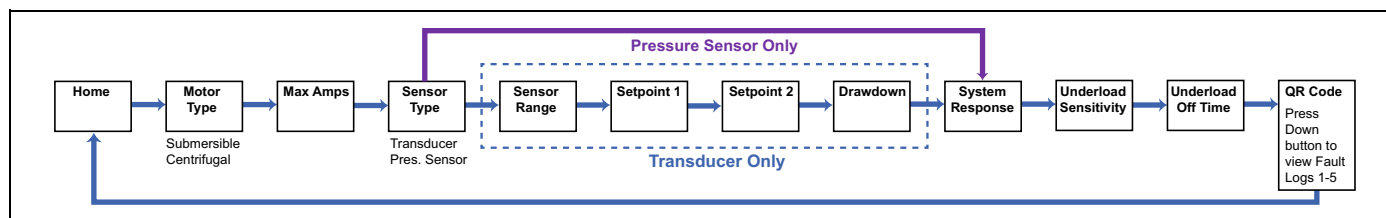
Use the arrow keys to the right of the Display to navigate through the setup menus.

- The right arrow moves from screen to screen, and also functions as an Enter key.
- The up and down arrows scroll through the available options on each screen.
- When a selection has been made, you must press the Enter key (right arrow) for the setting to take effect.



NOTE: If DIP SW1 – Position 1 is **ON**, settings can be made either through the manual display, or through the mobile app. Changes in either tool are reflected in the other. Power cycling the drive is not required for menu based or DIP switch settings to take effect.

Menu Navigation



Home Screen: In normal operation, this screen displays the current system status. During setup, pressing the Enter key (right arrow) changes the display to the **Motor Type** screen.

Motor Type: Configures the drive for the type of motor being used. Selecting SUB configures the drive for use with a submersible motor. Selecting CEN configures the drive for an above-ground, centrifugal motor.

NOTE: SUB drive models can be configured for either type. CEN drive models can only be configured for CEN pump/motor type.

Max Amps: The Max Amps value is used to configure various protection features (pump underload, motor overload, etc.). This value should match the Service Factor Amps or Maximum Amps rating listed on the motor nameplate.

Sensor Type: Configures the drive for the type of pressure transducer or sensor being used. Selecting **Transducer** displays the **Sensor Range** screen. If a standard **Pressure Sensor** is selected, the target pressure is set using the adjusting screw on the sensor itself. The **System Response** screen is displayed next for Pressure Sensor use.

Sensor Range: This is only configurable when the sensor type is transducer. This setting scales system operation to the installed transducer. The range is 100 to 300, with a default setting of **200 PSI**. When changing, the setting changes in 10 PSI increments.

Setpoints: Drive speed control is based on the difference between the setpoint and the transducer feedback value. As user demand (flow) causes pressure changes, the drive varies the output frequency (motor speed) to maintain pressure at or near the target setpoint. There are two user configurable setpoints in the system—Setpoint 1 and Setpoint 2. If an application has different pressure requirements for specific uses, the dual setpoint feature can be used by connecting a switch to the **Dual Setpoint** terminal block on the control board. Refer to [“Control Circuit Connections” on page 5](#). When the dual setpoint input is open, Setpoint 1 is used for pressure control. When the input is closed, Setpoint 2 is used.

- **Setpoint 1:** When using a Pressure Transducer, use this screen to set the desired target pressure the system will maintain during normal operation. Recommended maximum value is 5% less than sensor max for proper operation.
- **Setpoint 2:** Set an alternate setpoint here.

NOTE: Factory defaults for the Setpoints are 0 PSI. This puts the drive in the Sleep/Stop state, keeping the drive from running while programming takes place. The Drive will run 5 seconds after SETPOINT 1 is adjusted above 0 PSI and NEXT button is pressed.

IMPORTANT: Monitor pressure gauge during initial startup to ensure system does not over-pressurize.

QUICKSTART GUIDE

Drive Configuration

Drawdown: When using a pressure transducer, a pressure offset can be set to allow for more water to be drawn from the pressure tank before a sleeping drive will start. This will reduce sleep/wakeup cycles.

For example, a system setpoint pressure of 50 PSI and a drawdown value of 20 PSI would cause the drive to maintain system pressure at 50 PSI when running; however when the system is idle, the drive will not start the motor until the system pressure drops below 30 PSI.

System Response: System response time affects how the drive reacts to the pressure transducer/sensor feedback. Faster response times can improve pressure stability in some systems. However, if the response is too fast, the system could overshoot, leading to overpressure, rapid cycling, or hydraulic noise. Selections include SLOW, MEDIUM, FAST, and Custom. These control the following configuration items:

- Proportional Gain, default = 500
- Integral Time, default = 25 (2.5 seconds)
- Ramp Time, default = 10 (1.0 seconds)
- Acceleration Time, default = 2s for SUB, 20s for CEN
- Deceleration Time, default = 2s for SUB, 20s for CEN

Underload Sensitivity: The drive is configured to ensure detection of Underload faults in a wide variety of pumping applications. In rare cases (as with certain pumps in shallow wells), this trip level may result in unnecessary faults. If the pump is installed in a shallow well, activate the drive and observe system behavior. Once the system begins to regulate pressure, check operation at several flow rates to make sure the default sensitivity does not cause false Underload trips.

- **Shallow Set:** If the pump is installed in an extremely shallow well and the system continues to trip, then adjust to a lower sensitivity setting. Check the Underload trip level and repeat as necessary.
- **Deep Set:** In cases where the pump is set very deep, run the system at open discharge to pump the well down and observe carefully that an Underload is detected properly. If the system does not trip as it should, adjust to a higher sensitivity setting.

Underload Off Time: This setting determines how long the drive will wait before attempting to run after an Underload event. The default is Smart Reset, but is user-adjustable from 5 minutes to 24 hours.

- Smart reset will set the underload off time to 5 minutes for the first fault. If the drive faults again immediately following the 5 minute off time, the next off time is doubled.

QR Code: This screen displays a code identifying the drive for connection to the mobile app. This screen also displays the software version and the drive/motor voltage.

Fault Codes: While the QR code is displayed, pressing the DOWN button causes the display to scroll through the last five fault codes beginning with the most recent one. The display shows the Fault Log Number (1-5), Fault Code, Fault Description, Date/Time (shown as mm/dd/yy hh:mm:ss).

Special Functions

Reset to Factory Settings: From the HOME screen, press and hold the UP/DOWN/NEXT buttons at the same time for 3 seconds. A confirmation screen (Are you sure?) appears in the display. Choosing YES restores all programmable parameters to factory default settings (fault history is NOT cleared). Choosing NO reverts back to the HOME SCREEN.

MANUAL STOP Mode: From the HOME screen, press and hold UP/DOWN buttons together for 2 seconds to manually place the drive in STOP mode. The display shows STOP in the upper right corner of the HOME screen where RUN/STOP status is shown (same as placing a jumper on the RUN/STOP input terminal).

When activated, MANUAL STOP displays centered at bottom of HOME screen where the motor speed (HZ) and output current (A) readouts were displayed.

Pressing the UP/DOWN buttons again for 2 seconds removes the drive from manual stop mode.

Operation

Hand/Auto Mode

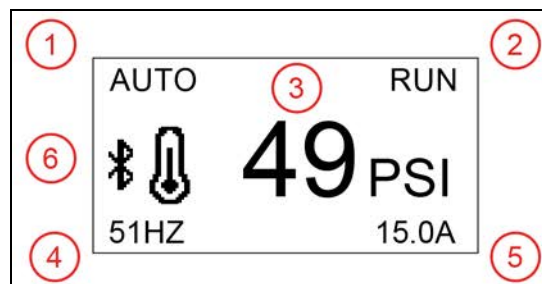
When powered up, the drive reads the signal on Control Board J10 (Hand/Auto). If a Hand/Auto switch is not used, the absence of a connection here appears as an open switch, and puts the drive in Auto mode. When a Hand/Auto switch is used, an open switch puts the drive in Auto mode. In Auto mode, the drive controls the pump to maintain a constant pressure.

If a Hand/Auto switch is connected to Control Board J10 (Hand/Auto), closing the switch puts the drive in Hand mode. Hand mode runs the pump at a constant speed (default is 60 Hz, shown in the display). Hand mode allows the drive to be run at full speed without a pressure transducer for longer periods of time as in the case of new well development or system start up. Moving the switch back to Auto mode resumes the automatic pressure tracking and control by the VFD.

System Status

When the drive is controlling the motor and pump, the display is illuminated and the following information is shown:

1. Whether the system is in HAND or AUTO mode.
2. Whether the motor is running (RUN) or stopped (STOP).
3. When using a pressure transducer, the system displays the current system pressure in PSI.



When using a standard pressure sensor, the system displays the current motor speed (in Hz).

When running in HAND mode, the system displays the keypad frequency setpoint.

4. When using a pressure transducer in AUTO mode, the motor speed is displayed at the lower left of the screen. In HAND mode, current system pressure is displayed.

When using a standard pressure sensor, this field is not displayed.

5. The lower right of the screen displays output current in Amps.
6. The Bluetooth icon indicates that the VFD is connected to a mobile device running the FE Connect - SubDrive Connect Plus mobile app. A thermometer icon displayed at the left side of the screen indicates the drive is in Over Temperature Foldback

Fault Detected

If a fault condition occurs, the drive displays the Fault Code and Fault Description.

Several faults reset automatically, displaying a countdown timer until the reset occurs. Pressing the DOWN button while the countdown timer is active resets the fault immediately. For faults that require a manual reset, turn off power to the drive (power cycle) and restart after five minutes.

Refer to [“Diagnostic Fault Codes” on page 11](#) for details.

FAULT CODE: F27
TRANSDUCER
SIGNAL LOSS

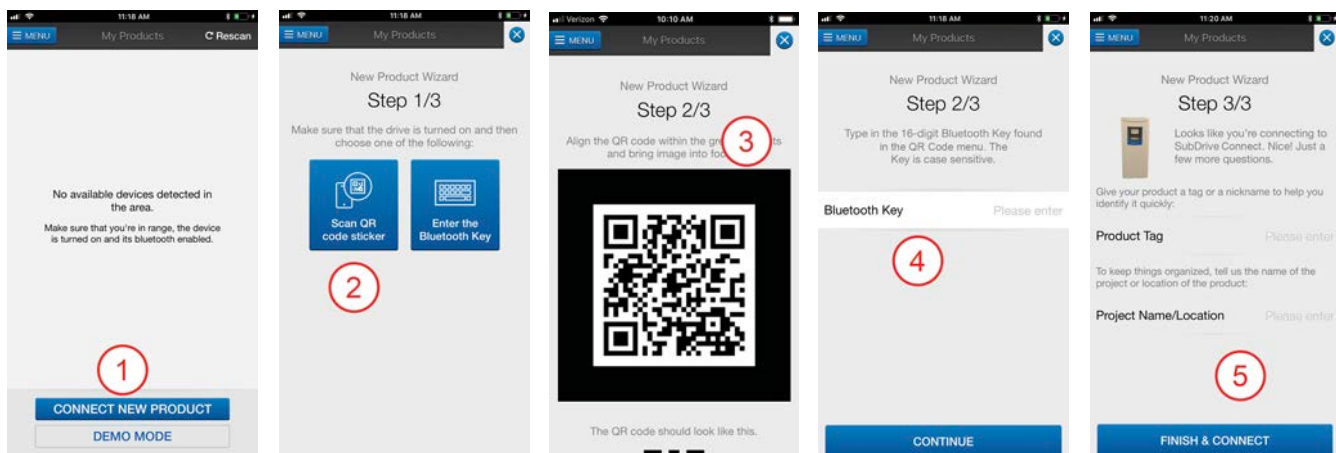
FE Connect Mobile App for SubDrive Connect Plus

The SubDrive Connect Plus companion app is an intuitive way to wirelessly configure and control your VFD. It provides features such as:

- Simple, application-based setup for quick and easy startup
- Create templates for fast configuration of multiple drives
- MultiDrive set up and control
- Informational dashboard for visual monitoring of system performance
- Mobile control mode for easy Hand mode operation
- In-app troubleshooting with fault time and date logging
- Email system logs directly to FE support
- Wireless drive firmware updates from your phone

Search for FE Connect in your mobile device's app store. In the search results, locate the *FE Connect SubDrive Connect +* app and install it. Once installed, the app icon is named *SubDrive Plus*.

Setup Bluetooth Connection



After installing the SubDrive Plus app, use the following procedure to connect to the drive:

1. From the Home screen, tap “Connect New Product.”
2. On the **New Product Wizard** screen, tap either **Scan QR Code** or **Enter the Bluetooth Key**.
3. If using the scanning tool, center the QR code on the drive in the screen. The code is displayed on the VFD display and on a sticker to the right of the display. Refer to [“Menu Navigation” on page 7](#).
4. If using the Bluetooth key, (also available onscreen) enter it in the box provided.
5. Enter a Name and Location to identify the drive within the app.
6. Tap Finish & Connect to complete the connection.

Using the Mobile App

To communicate with a SubDrive Connect Plus that has been paired with the app:

1. On the **My Products** screen, tap the name of the drive to connect to the device and enter the Dashboard.
2. Tap the **MENU** button to for a list of options.
3. Tap **Setup** to change VFD settings.

IMPORTANT: We recommend that the app be updated before going to installation site. Open the app when connected to the internet to get the latest update.

Troubleshooting

Diagnostic Fault Codes

Code	Reset	Fault	Possible Cause	Corrective Action
F1	Auto	Motor Underload	<ul style="list-style-type: none"> Over-pumped well Broken shaft or coupling Blocked screen, worn pump Air/gas locked pump Underload Sensitivity setting incorrect 	<ul style="list-style-type: none"> Frequency near maximum with load less than configured ULD sensitivity System is drawing down to pump inlet (out of water) High static, light loading pump - reset for less sensitivity if not out of water Check pump rotation, reconnect if necessary for proper rotation Air/gas locked pump - if possible, set deeper in well to reduce
F2	Auto	Undervoltage	<ul style="list-style-type: none"> Low line voltage Misconnected input leads Loose connection at breaker or panel 	<ul style="list-style-type: none"> Line voltage low, Check incoming power connections and correct or tighten if necessary Correct incoming voltage - check breaker or fuses, contact power company
F3	Auto	Overcurrent or Locked Pump	<ul style="list-style-type: none"> Motor and/or pump locked Abrasives in pump Excess motor cable length 	<ul style="list-style-type: none"> Amperage above SFL at 30 Hz Remove and repair or replace as required Reduce motor cable length. Adhere to Maximum Motor Cable Length table.
F5	Manual	Open Phase	<ul style="list-style-type: none"> Loose connection Defective motor or drop cable Wrong motor 	<ul style="list-style-type: none"> Open reading on DC test at start. Check drop cable and motor resistance, tighten output connections. Use dry motor to check drive functions.
F6	Manual	Short Circuit	<ul style="list-style-type: none"> When fault is indicated immediately after power-up, short circuit caused by a shorted connection, defective cable, splice or motor 	<ul style="list-style-type: none"> Amperage exceeded 25 amps on DC test at start or SF amps during running Incorrect output wiring, phase to phase short, phase to ground If fault is present after resetting and removing motor leads, replace drive
F7	Auto	Overheated Drive	<ul style="list-style-type: none"> High ambient temperature Direct sunlight Obstruction of airflow 	<ul style="list-style-type: none"> Fan blocked or inoperable, ambient above 122 °F (50 °C), direct sunlight Replace fan or relocate drive as necessary Remove debris from fan intake/exhaust
F9	Manual	Internal PCB Fault	<ul style="list-style-type: none"> A fault was found internal to drive 	<ul style="list-style-type: none"> Contact Technical Service
F12	Auto	Overvoltage	<ul style="list-style-type: none"> High line voltage Internal voltage too high 	<ul style="list-style-type: none"> Check incoming power connections and correct or tighten if necessary If line voltage is stable and within range, contact Technical Service
F14	Manual	Broken Pipe	<ul style="list-style-type: none"> Broken pipe or large leak is detected Drive runs at full power for 10 minutes without reaching pressure setpoint Large water draw does not allow system to reach pressure setpoint 	<ul style="list-style-type: none"> Check system for large leak or broken pipe If the system contains a sprinkler system or is being used to fill a pool or cistern, disable the Broken Pipe Detection
F15	Manual	Phase Imbalance	<ul style="list-style-type: none"> Motor phase currents differ by >20% Motor is worn internally Motor cable resistance is not equal Incorrect motor phase setting 	<ul style="list-style-type: none"> Check resistance of motor cable and motor windings Verify motor type matched drive settings (single- or three-phase)
F16	Manual	Ground Fault	<ul style="list-style-type: none"> Motor cable is damaged Phase to ground short 	<ul style="list-style-type: none"> Check motor cable insulation resistance with megger (while not connected to drive). Replace motor cable if needed.
F25	Manual	Moisture Sensor Fault	<ul style="list-style-type: none"> Moisture or water detected Input is incorrectly configured 	<ul style="list-style-type: none"> Check Moisture Sensor location for moisture or presence of water. Ensure Moisture Sensor input is configured correctly
F27	Auto	Pressure Transducer Error	<ul style="list-style-type: none"> Transducer has failed Transducer is incorrectly wired Transducer signal is out of range Transducer is disconnected Incorrect sensor type setting 	<ul style="list-style-type: none"> Check pressure transducer wiring connections Ensure sensor type setting is correct Replace pressure transducer


Safety Information

This equipment should be installed and serviced by technically qualified personnel who are familiar with the correct selection and use of appropriate tools, equipment, and procedures. Failure to comply with national and local electrical and plumbing codes and within Franklin Electric recommendations may result in electrical shock or fire hazard, unsatisfactory performance, or equipment failure.

Read and follow instructions carefully to avoid injury and property damage. Do not disassemble or repair unit unless described in this manual.



Failure to follow installation or operation procedures and all applicable codes may result in the following hazards:

⚠ WARNING

 **High voltages capable of causing severe injury or death by electrical shock are present in this unit.**

- To reduce risk of electrical shock, disconnect power before working on or around the system. More than one disconnect switch may be required to de-energize the equipment before servicing.
- Make sure the ground terminal is connected to the motor, control enclosures, metal plumbing, and other metal near the motor or cable using wire no smaller than motor cable wires.


⚠ CAUTION

  **Risk of bodily injury, electric shock, or property damage.**

- This equipment must not be used by children or persons with reduced physical, sensory or mental abilities, or lacking in experience and expertise, unless supervised or instructed. Children may not use the equipment, nor may they play with the unit or in the immediate vicinity.
- Equipment can start automatically. Lockout-Tagout before servicing equipment.
- This equipment produces high temperatures during normal operation. Use caution when contacting surfaces.
- Operation of this equipment requires detailed installation and operation instructions provided in this manual for use with this product. Read entire manual before starting installation and operation. End User should receive and retain manual for future use.
- Keep safety labels clean and in good condition.

Product Specific Precautions

⚠ WARNING

 **High voltages capable of causing severe injury or death by electrical shock are present in this unit.**

- To minimize risk of electrical shock, disconnect power before working on or around the system.
- Serious or fatal electrical shock may result from failure to connect the ground terminal to the motor, drive, metal plumbing, or other metal near the motor or cable, using wire no smaller than motor cable wires.
- Do not remove or install VFD cover for wiring, periodic inspections, or adjustments while power is applied, or the unit is in operation.
- Capacitors inside the drive can still hold lethal voltage even after power has been disconnected—ALLOW 5 MINUTES FOR DANGEROUS INTERNAL VOLTAGE TO DISCHARGE BEFORE REMOVING COVER.
- Operate VFD and control devices with dry hands.
- Do not use VFD if power or motor cable is damaged.
- Do not apply power to a damaged VFD or to VFD with missing parts.
- Perform wiring after VFD has been mounted. Otherwise, electric shock or bodily injury can occur.
- Do not handle the VFD with wet hands or when standing on a wet or damp surface, or in water.

NOTICE

Risk of damage to drive or other equipment.

- Install and wire VFD according to the instructions in this manual.
- Take protective measures against ESD (Electrostatic Discharge) before touching control boards during inspection, installation or repair.
- This product is recommended for use with Franklin Electric 4-inch and 6-inch submersible motors or above-ground centrifugal motors. Use of this unit with any other Franklin Electric motor or with motors from other manufacturers may result in damage to both motor and electronics.
- In applications where water delivery is critical, a replacement pressure sensor and/or back-up system should be readily available if the drive fails to operate as intended.



For technical assistance, parts, or repair, please contact:

800.348.2420 | franklinwater.com

Form 226203202 Rev. 000 09/20



Copyright © 2020, Franklin Electric, Co., Inc. All rights reserved.