Greenheck Technical Support
RTU Start-up Report
Data & Analysis

GREENHECK
Building Value in Air.

Job Information

Job Name: _____

Unit Sales Order Number: _____

Unit Serial Number: _____

Technician Information

Start-up Company: _____

Technician Name: _____

Start-up Date: _____

This report consists of recorded data as observed by a Greenheck certified technician on the date indicated. The data is generated by a series of tests of the individual subsystems within the air handler. The entire system (with all subsystems functional) is tested to observe proper operation of the standard sequences within the completed air system of the occupied space. The air handler itself has been engineered to meet criteria specified by the owner but field conditions often vary from design specifications. During the course of this start-up, the Greenheck technician will make needed minor adjustments to operating parameters to produce the desired operating characteristics. The testing of this unit is based upon completed installation of the unit. All associated ductwork is to be intact and completed. A completed Pre Start-Up Checklist is to be furnished by the installer prior to the unit start-up.

SPECIAL TOOLS REQUIRED

- Voltage Meter (with wire probes)
- Amperage Meter
- Pressure Gauges – (refrigerant)
- Manometer

Because field conditions may change after the start-up testing of this unit, the recorded data points are subject to change.

As each sub-system is isolated and tested, critical data is observed and recorded. This data should be preserved as a benchmark, to be used by others for purposes of normal maintenance and for possible troubleshooting of the system. Due to seasonal ambient conditions, it may not be possible to test full operational ranges of all subsystems.

All data is analyzed by the Greenheck technician and anomalies are recorded in the “Notes” portion of each subsystem. The analysis on the final page of this report indicates whether the system operates as intended and may make recommendations regarding potential areas of concern.

Scan for additional equipment information and IOM

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Air Handler Cabinet Inspection

Exterior Air Handler Inspection

Yes	No	N/A	
			Is there shipping damage present? If yes, please send pictures to technical support.
			Do all seams have caulking present?
			Do all access doors and handles open properly?
			Are all hoods, louvers, and bird screens secure?
			Are all shipping covers removed (shipping wrap, duct covers)?
			Are unit clearances adequate for service and operation as stated in IOM?
			Is all ductwork connected and sealed properly?
			Are drain connections and traps present and fabricated in accordance with the IOM?
			Is freeze protection present on drains and traps?
			Are all hardware fasteners tightened?

Interior Air Handler Inspection

Yes	No	N/A	
			Is there shipping damage present?
			Do all seams have caulking present?
			Are the interior and drain(s) free of construction debris?
			Are all damper seals present?
			Are all hardware fasteners tightened?
			Do all blower wheels spin freely and smoothly when rotated by hand?
			Are all major component hardware tightened?
			Are all shipped loose items removed from interior?
			Are all air filters present?

☐ Outside Air ☐ Supply Air ☐ Return ☐ Exhaust Air

Control Panel Documentation

***Perform the following inspections with the main disconnect OFF.**

Yes **No** **N/A**

Is the remote user terminal display and cable present?

Are all control wiring connections secure?

Are all field-wired sensors landed (pressure, fire, smoke, temperature, etc.)?

Is wiring schematic on cabinet door?

Supply Power Inspection

Inspect all electrical connections

Phasing correct

Main Voltage		Rated Voltage
L1 - L2		
L2 - L3		
L1 - L3		

Note to owner: Although the motors and electronic devices in this unit can tolerate some variation in the actual supplied voltage relative to the rated voltage, these variations are always a concern. Variations in excess of +/- 4% may result in shortened component life, elevated operating temperatures and/or inconsistent performance. Whenever the supplied voltage varies from the rated voltage by more than this amount, preventive maintenance should be enhanced to include an aggressive inspection of VFDs and electric motors. It is recommended that if the supplied voltage varies by more than this amount, an electrical contractor be engaged to discover the problem and correct it.

Yes **No**

Does line voltage match rated voltage?

Is the line voltage wired correctly into the main disconnect?

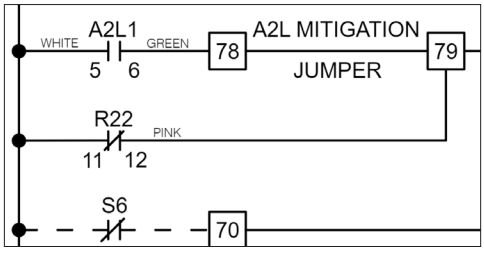
Does the supply voltage in this unit vary from the rated voltage by more than +/- 4%?

Refrigerant Leak Detection System

Unit equipped with refrigerant leak detection sensors. In the event of a leak in the air tunnel, the unit will move stagnant refrigerant from within the unit, duct, and space ensuring proper dilution. Alarm outputs available for monitoring and external action requirements which includes opening of zone dampers in the ductwork, disabling duct-mounted electric resistance heaters, and/or enabling mechanical ventilation if required. These outputs are available to the building management system or through hardwire mitigation system contacts in the unit control section. Verification of the mitigation system response must be performed at start-up by removing the A2L mitigation test jumper found in the control section of the unit. Additional testing may be required by local code. The refrigerant sensors installed in the appliance will initiate a safety sequence if a leak is detected. Maintain that the sensor is free of any dust or other contaminants. The alarm status is available in the form of an electronic signal from the appliance controller and a relay dry contact suitable for building safety sequences.

Building Fire Alarm Shutdown

Unit is equipped with a building fire alarm relay. The building fire alarm contacts need to land across terminal “R” and “70” before equipment operation is allowed. Please refer to local codes and AHJ (Authorities Having Jurisdiction) for your job requirements. See image on the right.



A2L Refrigerant Mitigation Sequence

Unit is equipped with A2L mitigation sequence. To test proper function of mitigation sequence, A2L test jumper from equipment terminal blocks 78/79. See image on the right.

Using Manual Overrides to Complete Startup

To enter manual override mode to test individual unit components, follow these steps:

1. **Ctrl Variables**
2. **Advanced**
3. **Login**
   (Enter password 1000 or 9998 and the controller will auto boot you back to the "Advanced Menu" after a couple of seconds)
4. **Manual Overrides**

Before overriding the unit to the On position *(Figure 2)* make sure ALL components not currently being tested are set to Manual Off.

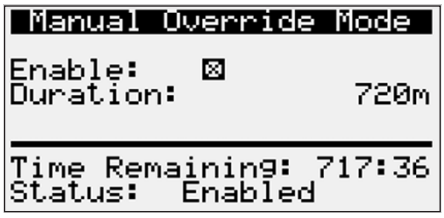


Figure 1 - Enable Manual Override Mode

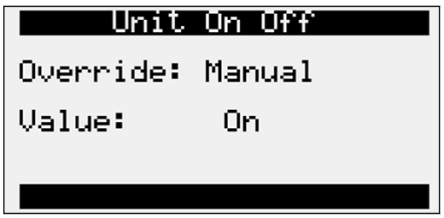


Figure 2 - Manually Override Unit On

Dampers and Actuators Functional Test

Open Smooth, Close Tight? **Match Control Command?** **N/A**

Outside Air?

Recirculation Air?

Exhaust or Relief Air?

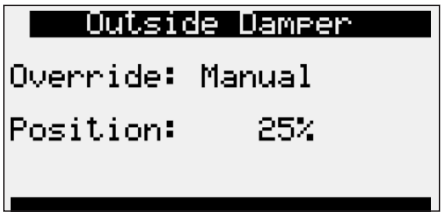


Figure 3 - Manually override damper to 25% as shown

Blowers and Blower Motors

Supply Air Blower and Motor

Fan 1 **Fan 2**

Check all fasteners, set screws and locking collars.

Check bearing alignment and lubrication.

Check for correct rotation direction.

Overloads set to 100-115% of motor nameplate FLA.

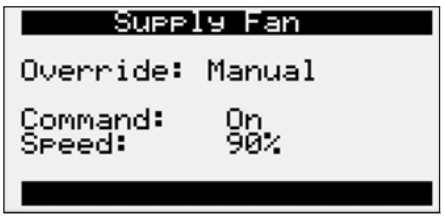


Figure 4 - Manually Overriding the Supply Fan on *(Leave the damper overridden to its open position when testing fans, to avoid pressure issues).*

Exhaust Blower and Motor

Fan 1

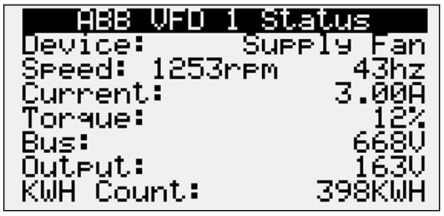
Check all fasteners, set screws and locking collars.

Check bearing alignment and lubrication.

Check for correct rotation direction.

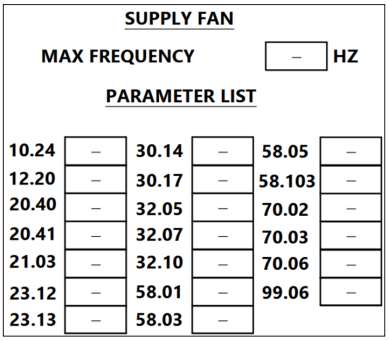
Overloads set to 100-115% of motor nameplate FLA.

Supply & Exhaust Fan Performance



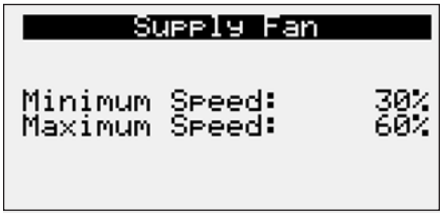
From main controller menu, scroll down to find ABB VFD 1 Status, record values. Scroll down if equipped with a second supply VFD or exhaust VFD to record those values.

	ABB VFD 1	ABB VFD 2	ABB VFD 3
Device			
Speed (RPM/HZ)			
Current			
Torque			
Bus			
Output			
KWH Count			



Fan Speed Adjustments

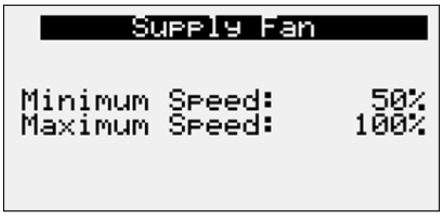
Locate parameter list label on exterior of RTU. The values shown are factory modified parameters.



To reduce fan speed, navigate Carel as shown below.

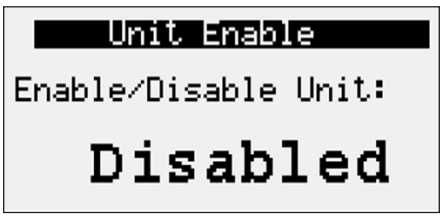
A minimum of 50% of design airflow is required for proper heating/cooling performance. Don't reduce supply airflow below 50% design (max) without factory guidance.

Control Variables> Fan Control> Supply or Exhaust Fan



To increase fan speed above design, VFD adjustment will be required:

- 12.20 = Frequency at 10vdc input. Increase/decrease to match target frequency.
- 30.14 = Maximum Frequency. Increase/decrease to match target max frequency.
- 99.06 = Motor FLA. Adjust within service factor if needed.
- 96.07 = Save Settings. Change to a 1 to save. Will resort back to 0 once saved.



How to Navigate ABB ACH-180 VFD

Disable the RTU – Press target button and navigate to unit enable. Switch to disabled.

How to Navigate ABB ACH-180 VFD

1. Press “OK” on main screen.

2. Navigate to parameters (option 5) and press “OK”.

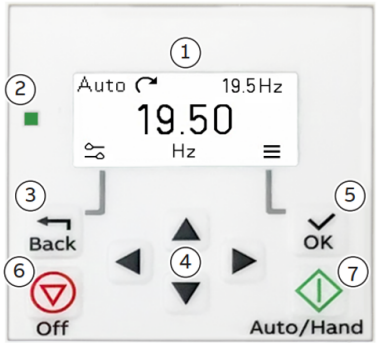
3. Option 1 (top left) is a complete parameter list. Option 2 (top right) is factory modified parameter list.

4. Navigate to parameter group to modify settings.

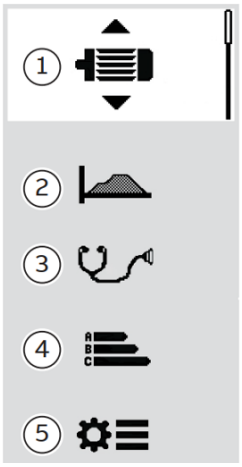
5. Once complete, navigate to parameter 96.07 and change to “1” to save changes.

Control panel

By default, ACH180 has an integrated control panel. You can also use an external control panel. For more information, refer to ACS-AP-I, -S, -W and ACH-AP-H, -W Assistant control panel's user's manual (3AUA0000085685 [English]).



1. Display. Shows the **Home** view as default.
2. Status LED. Green and red colors indicate the state and potential problems.
3. **Back** key. Opens the **Options** view.
4. Arrow keys for menu navigation and setting values.
5. **OK** key. Opens the **Menu** in the **Home** view.
6. **Off** key. Stops the drive and switches to the Off mode.
7. **Auto/Hand** key. Opens a selection screen view that allows the user to select between Auto and Hand modes.



1. Motor data - motor parameters
2. Motor control - motor settings
3. Diagnostics - faults, warnings, fault log and connection status
4. Energy efficiency
5. Parameters

Parameters

1. Complete parameter list - groups menu with complete parameters and parameter levels
2. Modified parameter list
3. Parameter restore - resets the drive to the factory default parameters

Indirect Fired-Gas Furnace Start-Up

I have read and followed the vendor-specific operation manual.

	Furnace #1
Fuel Type	
Manufacturer	
Model #	
Serial #	

Component Operational Checks

Furnace #

1 **2**

All gas piping has been checked for leaks

Airflow proving switch at High & Low Speed

High temperature limit

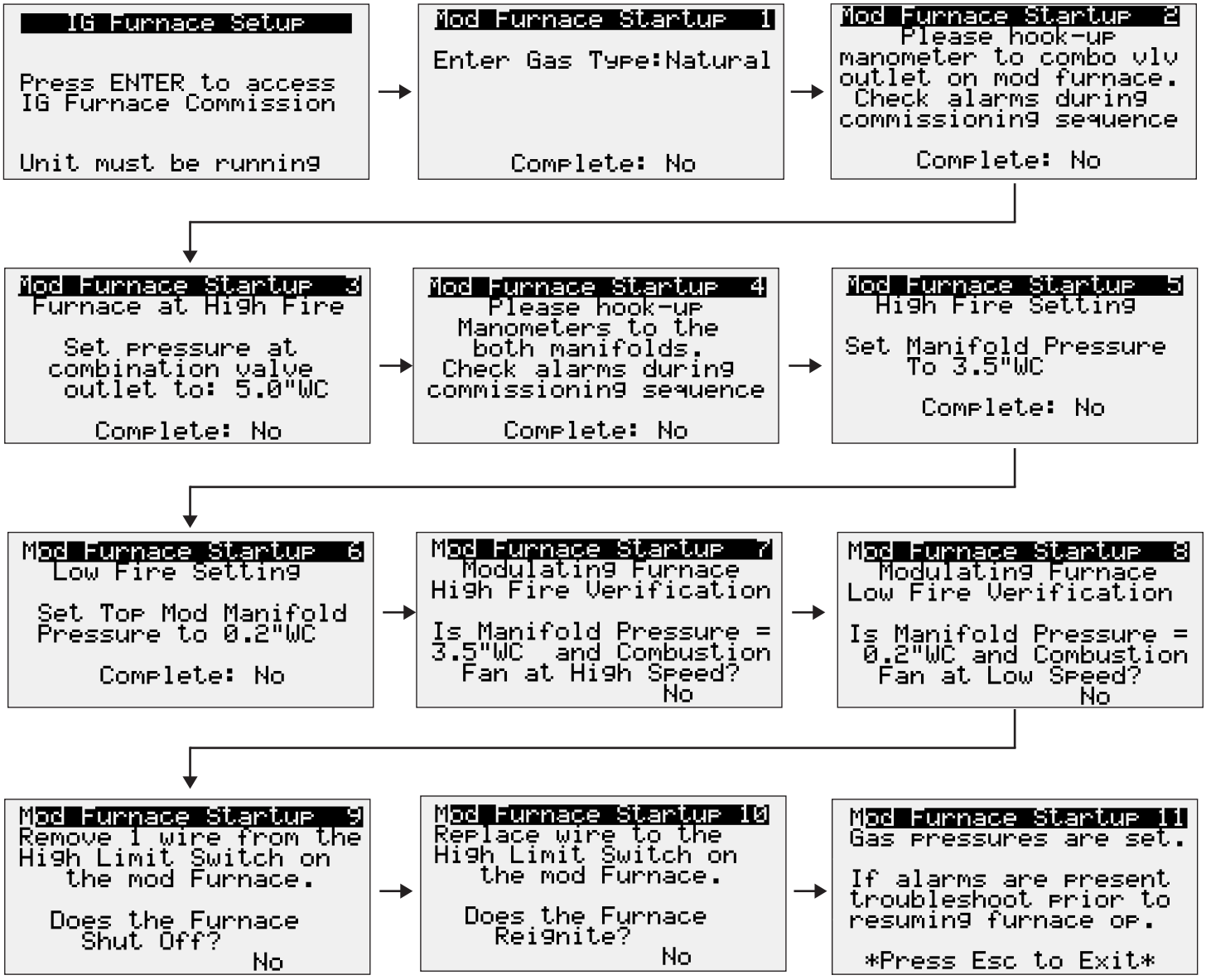
	Manifold 1	Manifold 2
Gas pressure at Inlet *(burners off)*		
Gas Pressure at Train Inlet *(high fire)*		
Gas Pressure at Burner Manifold *(high fire)*		
Gas Pressure at Train Inlet *(low fire)*		N/A
Gas Pressure at Burner Manifold *(low fire)*		N/A

Gas Set Point Guidelines
(all gas pressure readings must be taken from the gas manifold)

Natural Gas		**Propane**		**Modulating Control Signal**
High fire manifold	3.5 in. WC	High fire manifold	10.0 in. WC	Low fire = 0 VDC
Low fire modulating	.2 in. WC	Low fire (modulating)	.6 in. WC	High fire = 10 VCD

Furnace Start-up Steps

Beckett Furnaces



Electric Heater Start-Up

I have read and followed the vendor-specific operation manual.

Heater Model: _____

Heater Serial #: _____

Figure 5 - Electric Heat Override Page. Set override to manual and set to 100% to complete start-up.

Note: To ensure proper operation, leave dampers open and fans running when testing cooling heating components.

Electrical Inspection

Yes **No** **N/A**

Are all fuses present and free of defects?

Are all connections at contactors and heating elements tightened?

Operational Inspection

Yes **No** **N/A**

Is there sufficient airflow through heater (per design temperature rise from manufacturer's nameplate)?

Are combustible particles or flammable vapors present in the air tunnel?

Is the air temperature at the outlet of heater less than 151°F?

Is total differential pressure across heater above 0.07 inches of water?

Integral AC System Start-Up

Note: Start-up of any compressorized system is to be done only by a PA-608 certified technician. To see Manual Overrides associated with his startup see Pg. 4.

Check all fans for correct ration direction.

☐ Fans are rotating in correct direction.

Complete data runs as shown on the following page. Acquired data is to become part of the permanent unit records and function as a benchmark.

Testing	• Package DX
Data Run 1	• All compressors on in all available circuits • Modulating Compressor commanded to 100% See Figures 6 & 7 on page 12. • Hot Gas Reheat commanded to 0% • Record all data in table after minimum of 15 minute run time
Data Run 2	• All compressors on in all available circuits • Modulating Compressor commanded to 100% • Hot Gas Reheat commanded to 100%. See Figure 8 on page 12. • Record all data in table after minimum of 15 minute run time
Data Run 3	• Command modulating compressor to 50% to verify unloading is operational. See Figure 7 on page 12.
Data Run 4 (ASHP Only)	• Manual override reversing valve to heating. See Figure 9 on page 12. • All compressors on in all available circuits • Modulating Compressor commanded to 100% • Record all data in table after minimum of 15 minute run time

		Data Run 1		Data Run 2	Data Run 3	Data Run 4 ASHP Heating	
		Circuit A	*Circuit B*	*HGRH Circuit*	*Modulating Circuit*	*Circuit A*	*Circuit B*
Compressors Active							
Circuit							
% Reheat		0%	0%	100%		100%	100%
Reversing Valve		Cooling	Cooling	Cooling	Cooling	Heating	Heating
Discharge (psi)							
Compressors Discharge							
Liquid	(psi)						
	(°F)						
	Subcooling						
Suction	(psi)						
	(°F)						
	Superheat						
Oil Level (%)							
Time (minimum 15 min)							
OA (°F)							
SA (°F)							
DX (°F)							
Compressor Speed		100%	100%	100%	50% - Modulates? Y or N	100%	100%

Standard Operating Parameters				
Value	Suction Pressure	Discharge Pressure	Superheat	Subcooling
Range	107-155 PSI	250-460 PS	6-14°F	6-14°F
Optimal	125 PSI	375 PSI	10°F	10°F

Notes regarding AC data *(to include piping, wiring, compressors, leaks, etc.):*

NOTE: TO ENSURE PROPER OPERATION, LEAVE DAMPERS OPEN AND FANS RUNNING WHEN TESTING COOLING HEATING COMPONENTS.

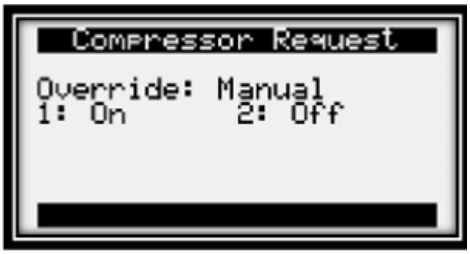


Figure 6 - Start/Stop signal to each compressor. Run each compressor individually and then run compressors that share circuits together. Record refrigeration numbers for each of these runs.

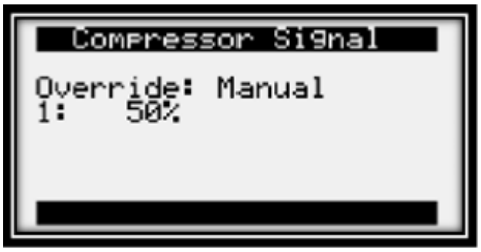


Figure 7 - Compressor Modulation signal. In order to run, digital scroll compressors require a start signal as well as a modulation signal of at least 10%.

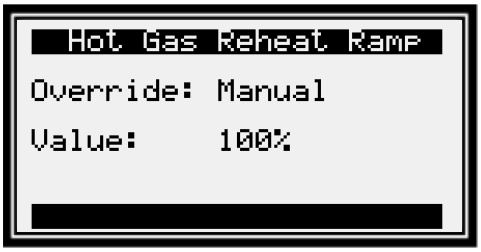


Figure 8 - Hot Gas Reheat Ramp. Change override to manual and demand to 100%.

Figure 9 - Reversing Valve. Change override to manual and demand to 100%.

Summary / Analysis of System

Please review this form before signing below.

☐ **Complete Report** ☐ **Incomplete Report**

By checking a box above and signing below, you acknowledge that the start-up report is either fully complete or will require completion at a later date.

Signature: _____ **Date:** _____

Submit Form