

The Fan Static Reset Kit accurately measures the static pressure drop across a clean air valve and provides feedback to the Building Management System (BMS) to optimize fan control. The sensor is housed in a rugged polycarbonate enclosure, which mounts directly to the valve base channel and has a 3-wire connection to the valve mounted controller for power and signal. Two pressure pickups, two pressure dampers and two, six foot lengths of silicon tubing are included for mounting upstream and downstream of the valve to obtain optimized pressure readings. One device with a range of 0.0 to 5.0" W.C. covers both medium and low pressure valves and allows for dynamic fan control to reduce energy consumption under varying flow conditions.

FEATURES

- Precision sensor provides accurate control feedback value
- Sensor mounts directly on valve base channel
- Pressure value is available network wide
- BMS can dynamically monitor and control fan static
- Maximize energy savings by running fans at lowest possible static

SPECIFICATIONS

Pressure Transmitter	
Pressure Range	0 to 5" W.C. (0 to 1.245 Pa)
Output Voltage	0.25 to 4.0 Vdc
Zero Pressure Output	0.25 ±0.06 Vdc
Accuracy	1.5% of span (0.0 to 3.0" W.C. at 75° F) (0 to 747 Pa at 23.9° C) 2.0% of span (3.0 to 5.0" W.C. at 75° F.) (747 to 1245 Pa at 23.9° C)
Proof Pressure	1 PSI either Port (6.9K Pa) (performance will be affected)
Burst Pressure	1.5 PSI either Port (10.4K Pa) (permanent damage will occur)
Corrosion Resistance	Pressure sensor is suitable for clean, non-corrosive, non-condensing air only
Supply Voltage	7 to 32 Vac or 7 to 40 Vdc
Power Consumption	0.12 VA maximum
Storage Temperature	40 °F to 203° F (-40° C to 95° C)
Operating Temperature	32° F to 140° F (0° C to 60° C)



Fan Static Reset Kit

SPECIFICATIONS (continued)

Temperature Error	±2% of Span (Over the Operating Temperature Range)
Enclosure	
Humidity	95% non-condensing
Material	Polycarbonate
Material Rating	UL94, V-0
Enclosure Rating	IP66
Dimensions	4.15" x 5.00" x 2.50" (105.4 mm x 127 mm x 63.6 mm)
Tubing	
ID/OD	1/8" / 1/4" (3.2 mm / 6.4 mm)
Wall Hardness	Shore A 70
Temperature Range	-137° F to 738° F (-94° C to 392° C)
Tensile Strength	1350 PSI

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ORDERING GUIDE

FSR100

BASE NUMBER

FSR100 = Fan Static Reset Kit (includes the following)

- 1 - 0 to 5 inch W.C. differential pressure sensor with 0.25 to 4.00 Vdc output
- 2 - Pressure pickup
- 2 - Pressure dampers
- 2 - 6 foot (1.83 m) sections silicon tubing
- 1 - Mounting bracket
- 1 - Miscellaneous mounting hardware

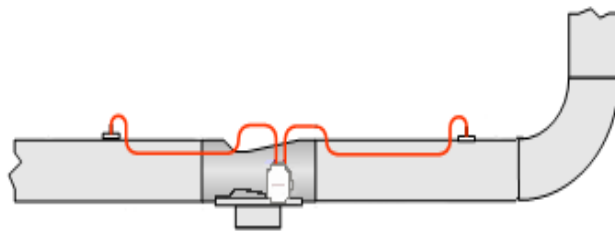
APPLICATIONS

The Fan Static Reset (FSR) kit measures the pressure drop across select Accel II valves and passes this value across the network to allow the BMS to potentially save energy by optimizing fan speed control. By continuously monitoring the static pressure at the lowest point in the system, the BMS can trim fan speed as flow conditions and static pressure in the system changes. The intent is to control the fans at the lowest practical speed to gain whatever energy savings is possible while ensuring there is sufficient static pressure for the pressure independent cone assembly to maintain the desired flow.

The FSR is intended to be installed across the valves in the duct runs believed to be the "worst case" in terms of pressure loss. These are typically the furthest from the fans or with the greatest number transitions, turns, or obstructions such as filter coils or dampers. A review of the duct layout drawings can provide clues to the location of the valve that will see the lowest system pressure, however, the lowest point may change based on different operational conditions. Spot checking may be the best way to determine the low point or it may be prudent to select a number of locations to install FSRs and perform a low-select as system conditions vary.

The FSR100 is intended for installation on "Clean air" (Supply or General Exhaust) valves. The materials of construction of the pressure pickup, tubing and the pressure sensor itself are not suitable for applications with corrosive or condensing vapors. Additionally, the fume hood valve controller does not have inputs available for connecting the pressure sensor or network variables for passing the value across the network. Therefore it should not be used on fume hood applications.

The FSR mounts on the valve base channel. The pressure pickups are installed in the duct work upstream and downstream of the valve and the pressure sensor is connected to the power source and available universal input of the valve controller. Then the Universal Input (UI) signal is scaled in the Configuration Plug-in program according to actual field measurements of pressure from the sensor.



It is important to recognize accuracies, errors and tolerances, as well as response times throughout the entire sensing and control system when choosing a static pressure control setpoint. If the total potential error (transmitter accuracy and temperature error) is ± 0.1 inch W.C. and the valves have a 1 second speed of response while the fan speed controller may require 20 to 30 seconds to respond to a change in setpoint, there must be sufficient safety margin in the setpoint to ensure the static pressure at the valve is never compromised.

INSTALLATION

The Fan Static Reset kit comes complete with all the components and mounting hardware necessary for installation. The pressure sensor mounts to the valve base channel and gets its power from the valve controller and connects to any available UI on the valve controller. The pressure pickups are mounted upstream and downstream of the valve and connected using the two supplied sets of silicon tubing and pressure dampers. Nylon wire ties and self-adhesive mounts may be used to secure the silicon tubing to the duct.

Mounting the sensor

The sensor is attached to a mounting bracket that can be mounted in several locations on the base channel depending on the size of the valve, its actuator type and what options are installed. Two locations, opposite the electronics enclosure have existing holes and are preferred for mounting the sensor (see 1 and 2 below). Two alternate locations, on opposite corners of the base channel (3 and 4 below) require the use of self-drilling, "Zip" screws. Use care when using the "Zip" screws so they do not pierce the valve body.

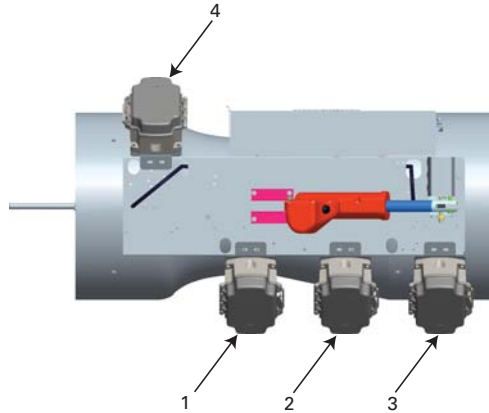


Table 1: Sensor Mounting Location and Actuator Type

Number	Location Type	Valve Size	Actuator Type
1	Preferred	All	All
2	Preferred	All	HiSEA and Pneumatic
3	Alternate ¹	All	All
4	Alternate ¹	12" and 14"	All

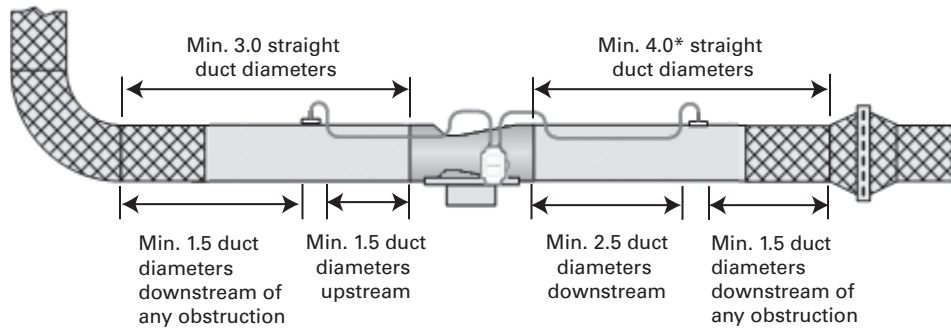
¹May be used if the preferred locations are obstructed by other components on the base channel

NOTE: Mount the sensor bracket using two screws in an orientation that allows access to the electrical connection port and permits the enclosure door to open allowing access to the internal wire connections.

Guidelines for locating the pressure pickups

For stable and accurate readings the duct runs immediately upstream and downstream must be straight and free of any obstructions such as bends, transitions, filters, dampers and coils. Per ANSI/ASHRAE *130-2008 Methods of Testing Air Terminal Units*, the duct immediately upstream and downstream of the valve must be uniform in shape with no obstructions for a minimum of 3.0 equivalent duct diameters upstream, and 3.5 equivalent duct diameters downstream of the valve. Anything less than the 3 uninterrupted duct diameters upstream and 3.5 diameters downstream is highly suspect and should not be used. The longer the straight uninterrupted duct runs upstream and downstream of the valve, the better the flow profile and the more stable and accurate the readings you will achieve.

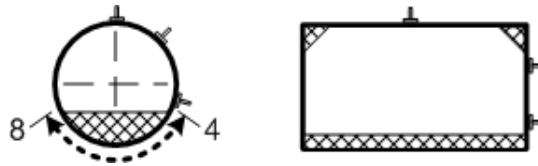
Additionally, the pressure pickups must be a minimum of 1.5 equivalent duct diameters upstream and 2.5 equivalent duct diameters downstream away from the valve. Any closer to the valve and turbulence from the valve components in the flow stream will likely compromise the stability and accuracy of any readings. As a general rule, the area within a minimum of 1.5 equivalent duct diameters downstream or upstream of any obstruction would be a poor location for the pressure pickup. The further away the pressure pickups are located from the valve and any other obstruction, the more stable and accurate the readings will be.



*ANSI/ASHRAE standard exceeded by FSR100 product requirement

NOTE: These guidelines should provide adequate readings. However, the only way to confirm the suitability of the pressure pickup location is to perform a full duct traverse following the procedures outlined in the ANSI/ASHRAE *111-2008 Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems*. If the pressure reading at the pressure pickup is within 5% of the values measured when the duct was traversed, this is the optimum location.

The pressure pickups must be located in a position on the duct that will not be susceptible to becoming clogged or allow condensation to enter the sensing tubes. On round or oval duct, it is recommended the pressure pickups be placed in the upper portion of the circumference of the duct between 8 and 4 o'clock. On rectangular duct, the preferred placement of pressure pickups is on top of the duct, well away from the corners. Other acceptable locations are at least 2-3" (51-76 mm) up the side wall of the duct and not near any corner of the duct. Mounting the pressure pickups on the bottom of the duct is not permitted.

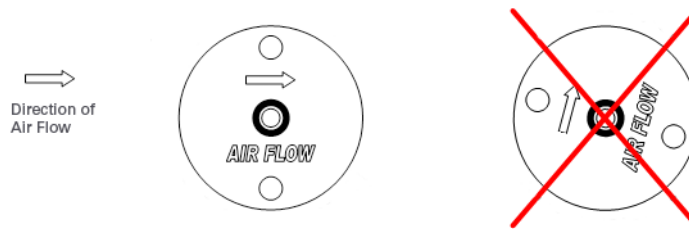


Mounting the pressure pickups

The pressure pickups are mounted directly to the duct using 2 self-drilling "Zip" screws (included). A closed cell foam gasket seals the pressure pickup to the duct.

Once you have determined the proper location of the pressure pickup, you will need an area free of any insulation. The pressure pickups must be mounted directly on the duct surface. The pressure pickups may not be used on double-walled or lined duct. If the duct is double-walled, contact your Phoenix Controls Representative for recommendations.

1. Orient the pressure pickup so that the arrow etched on the mount plate indicates the airflow direction.

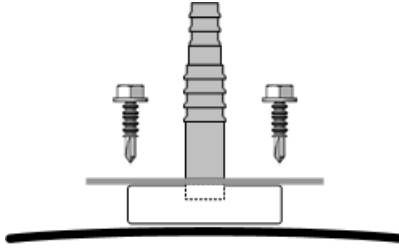


NOTE: It is important that the top and bottom mounting screws are oriented perpendicular to the direction of airflow so as not to cause obstructions near the pickup.

- Using 4 of the Zip screws (included) attach first one, then the other pressure pickup to the duct compressing the gasket evenly top and bottom.

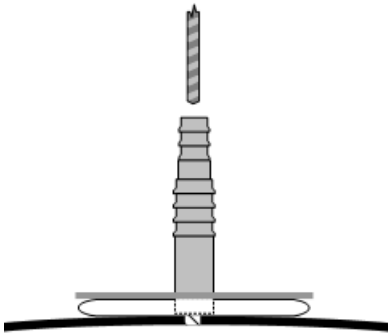
NOTE: Be careful not to over-tighten the screws and deform the plate or strip the mounting holes.

We recommend tightening to no more than 12 in.-lb. (1.35 Newton-meters).



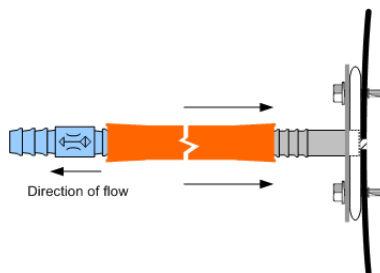
- Next, using the pressure pickup bar as a guide, drill a hole between $5/64"$ (.078"/1.98 mm) and $7/64"$ (.109"/2.77 mm) in the duct wall.

WARNING: Use care so as not to damage the barb with the drill bit.



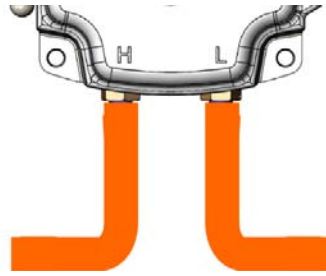
- Attach the short length of silicon tube containing the pressure damper, to the pressure pickup bar.

NOTE: Make certain that the pressure damper is oriented in the proper direction (arrow pointing AWAY from the pickup) as it is not bi-directional.



- Connect one end of the longer piece of silicon tubing to the pressure damper.

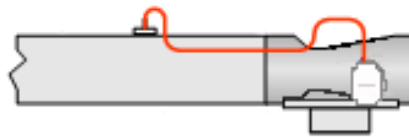
6. Cut it to length and connect it to the appropriate port on the sensor.
 - Upstream or "fan side" of the valve connects to the "H" (high) port on the sensor.
 - Downstream or "room side" of the valve connects to the "L" (low) port on the sensor.



NOTE: Make certain the tubing is not kinked and not in a position where moving parts on the valve could pinch or cut it.

7. Secure the tubing to the duct using the enclosed tie wraps and adhesive backed holders, or duct tape so that it cannot become tangled with any moving equipment in the area.

WARNING: Phoenix Controls recommends a "drip loop" somewhere along the tubing run to prevent moisture or condensation from reaching the ports on the pressure sensor. **Moisture will damage the sensor beyond repair.**



WIRING THE PRESSURE SENSOR

The pressure sensor is a 3-wire device; power, signal and circuit common. Three white crimp-on connectors are provided with the kit and are used to connect the wires coming off of the sensor printed circuit board (PCB) with a 3-conductor cable (provided by others) that terminates in the valve mounted controller enclosure. This cable leaves the sensor housing via the pre-drilled conduit port opposite the pressure ports so no enclosure modifications are required in the field.

A 3-conductor cable must be run between the pressure sensor enclosure and the valve mounted controller enclosure. Wiring details follow.

NOTE: Lead wire lengths will impact signal output/accuracy. Cable length should be limited to 5 to 10 feet (1.5 to 3 meters).

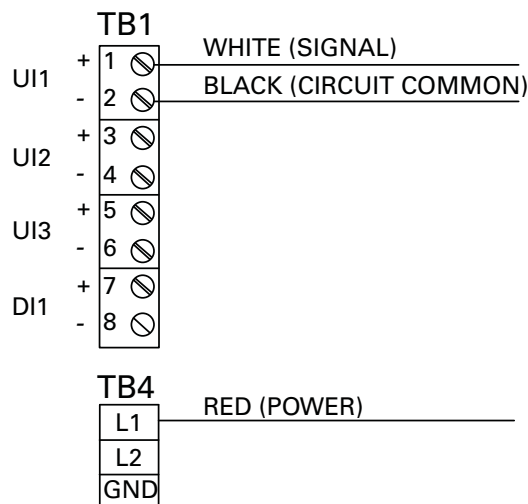
At the Sensor

- Red wire is for power
- White wire is for signal "+"
- Black wire is for circuit common

At the Celeris High-Speed Electric Controller

- FSR power wire terminates on TB4, Terminal 1 (L1)
- FSR signal "+" wire terminates on TB1, Terminals 1, 3 or 5 (+)
- FSR circuit common wire terminates on TB1, Terminals 2, 4 or 6 (-)

Celeris high-speed electric: any available UI (1, 2 or 3)

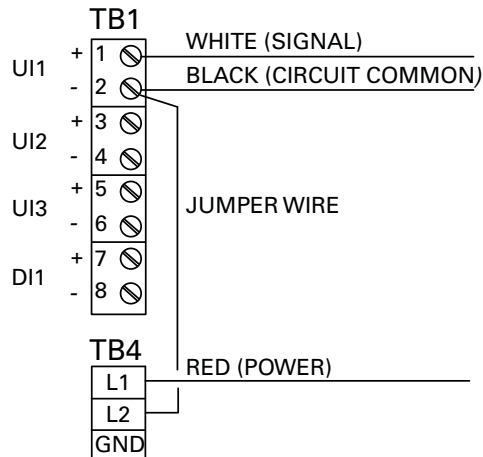


At the Celeris Pneumatic or Low-Speed Electric, or LON TP/SO Controller

- FSR power wire terminates on TB4, Terminal 1 (L1)
- FSR signal "+" wire terminates on TB1, Terminals 1, 3 or 5 (+)
- FSR circuit common wire terminates on TB1, Terminals 2, 4 or 6 (-)

NOTE: A jumper wire must be added between the circuit common termination and TB4, Terminal 2 (L2)

Celeris pneumatic, or low-speed electric, or LON TP/SO: any available UI (1, 2 or 3)

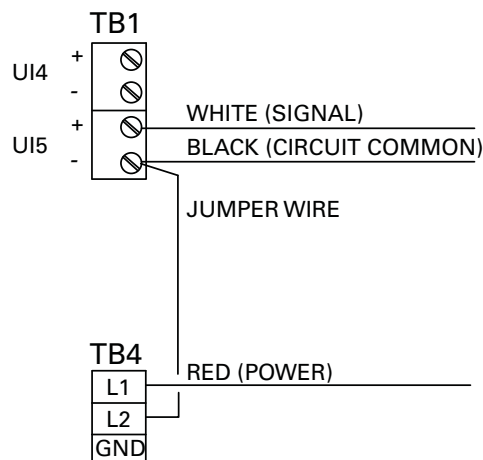


At the LON TX controller

- FSR power wire terminates on TB4, Terminal 1 (L1)
- FSR signal "+" wire terminates on TB1, Terminals 1, 3 or 5 (+) or TB8, Terminals 1 or 3 (+)
- FSR circuit common wire terminates on TB1, Terminals 2, 4 or 6 (-) or TB8, Terminals 2 or 4 (-)

NOTE: A jumper wire must be added between the circuit common termination and TB4, Terminal 2 (L2).

LON TX: any available UI (see LON TP/SO for 1, 2 or 3; see below for 4 or 5)

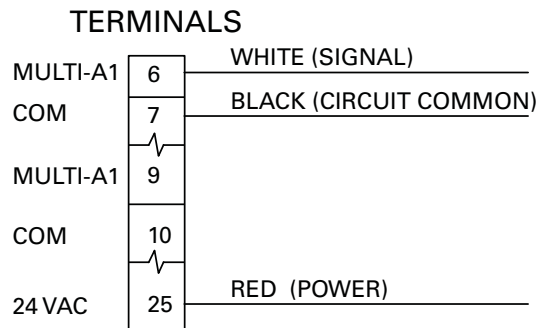


At the BACnet TX controller (BACnet TP, SO and EO controllers cannot be used with FSR100)

- FSR power wire terminates on Terminal 25 (24VAC)
- FSR signal "+" wire terminates on Terminals 6 or 9 (MULTI_AI)
- FSR circuit common wire terminates on Terminals 7 or 10 (COM)

NOTE: A jumper wire is not required on this controller.

BACnet TX: any available MULTI_AI



PHOENIX CONTROLS WIRING RECOMMENDATIONS

- All circuits must conform to the requirements of an NEC Class 2 (dry) circuit
- Use multiple transformers instead of larger transformers when more than 100 VA is required
- Each pressurization zone should have either a dedicated single-phase primary circuit, or a secondary circuit disconnect
- Use cable sizes recommended by Phoenix Controls (see Table 2)
- Use stranded wire for ease of installation
- Follow good wiring practices:
 - Locate cables away from sources of electrical interference (EMI/RFI)
 - Do not run signal or communication cable in the same conduit or wire way as power cables
 - If signal cable must cross power cables place these at a 90-degree angle
 - Shield or drain wires, if required, should be wrapped with insulating tape to prevent contact with exposed conductors or contacts
 - Maintain a consistent color code or polarity all the way through the wiring system
 - Power supply and signal isolation on I/O devices vary from manufacturer to manufacturer. Verify the wiring device manufacturer's recommendations for isolating power and signal common connections and maintain polarity
 - Local and national electrical codes take precedence
 - Strip 0.25" (6.4 mm) of insulation from each conductor, twist the strands, insert the conductor fully into the terminal block, and tighten the terminal
 - Test the wire connection by pulling on each conductor
 - See "Phoenix Recommended Cables" on page 11, for approved cable manufacturers and wire types

Table 2: Recommended Cable Sizes

Minimum	Maximum
22 AWG	16 AWG

MAINTENANCE

There are no user serviceable components in the Fan Static Reset Kit. If you suspect the pressure sensor is not sending out a signal, first check the power wiring to ensure the sensor has power.

TROUBLESHOOTING

<p>There is no signal input</p>	<ul style="list-style-type: none">• Check for power between the red and black wires• Power should be between 7 to 40 Vdc or 7 to 32 Vac• If no voltage is present check power source at the controller and interconnecting cable• If voltage is present, disconnect all other devices from the controller to see if the signal returns• Disconnect the white signal wire going to the controller and using a volt meter, check for a signal voltage <p>If the device has a proper power source and there is no output signal with all other devices disconnected, it must be returned to the factory for replacement.</p>
<p>The output signal appears to be incorrect</p>	<ul style="list-style-type: none">• With no differential pressure across the sensor, the output signal should be 0.25 Vdc \pm0.06 Vdc• Disconnect the tubing and connect a short piece of tubing across both the high and low pressure ports to shunt the high and low to the same value. The voltage output should be 0.25 Vdc<ul style="list-style-type: none">- If the signal is 0.25 Vdc but the pressure variable does not read 0, make sure the scaling in the Configuration Plug-in indicates 0.25 Vdc = 0" W.C.- If the zero output has shifted, there are no user adjustments on the sensor itself so the Configuration Plug-in must be used to rescale the input voltage (ex. 0.45 Vdc = 0" W.C.)• With differential pressure across the sensor if you suspect the signal is reading incorrectly<ul style="list-style-type: none">• There is no span adjustment on the pressure sensor. If a duct traverse indicates there is an error, the only option is to use the Configuration Plug-in to adjust the scaling of the input voltage range. For example, if 0" W.C. is at 0.45 Vdc and 5" W.C. is at 4.75 Vdc, the Configuration Plug-in scaling needs to indicate 0.45 Vdc = 0" W.C. and 4.75 Vdc = 5" W.C.

PHOENIX RECOMMENDED CABLES

A 3-conductor will typically be used with the FSR100.

Cable Type	Plenum Rated	Function	Wire Gauge	Primary Vendor/Part #	Alternate Vendor/Part #	Color Code	Notes
2C Round	No	24 Vac power to LOSEA or Pneumatic (110' max at load ^{1, 2})	18	Belden 9409		1: Red 2: Black	Must be stranded
		24 Vac power to HiSea (288' max at load ^{1, 2})	14	Belden 9411			
2C Round	Yes	24 Vac power to LOSEA or Pneumatic (110' max at load ^{1, 2})	18	Belden 82740	Windy City NP002360	1: Red 2: Black	Must be stranded
		24 Vac power to HiSea (288' max at load ^{1, 2})	14	Windy City NP007960			
TP	No	FTT-10 (4500') TP1250 (425')	22	Windy City 107500	Connect Air W221P-1002	1: White/Blue stripe 2: Blue/White stripe	For more alternatives visit: echalon.com
		FTT-10 (8800')	16	Windy City 109600			
TP	Yes	FTT-10 (4500') TP1250 (425')	22	Windy City 105500	Connect Air W221P-2001	1: White/Blue stripe 2: Blue/White stripe	For more alternatives visit: echalon.com
		FTT-10 (8800')	16	Windy City 109500			
3C Round	No	Signal	22	Belden 8443		1: Red 2: Black 3: Green	Must be stranded
3C or 4C Round	Yes	Signal	22	Belden 88444	Windy City 004380	1: Red 2: Black 3: Green 4: White (not used as 3C)	Must be stranded
4C Round	No	Signal	22	Belden 8444	Manhattan M13304	1: White 2: Green 3: Black 4: Red	Must be stranded
5C Round	No	Signal	22	Belden 8445	Manhattan M13305	1: White 2: Brown 3: Black 4: Red 5: Green	Must be stranded
8C	No	Signal	22	Belden 9421	Manhattan M13308	1: White 2: Orange 3: Black 4: Red 5: Green 6: Yellow 7: Blue 8: Brown	No substitutes
8C	Yes	Signal	22	Comtran 4956		1: White 2: Orange 3: Black 4: Red 5: Green 6: Yellow 7: Blue 8: Brown	No substitutes
3C MS/TP	No	Shielded	22	Belden 3106A (120 ohm)	See specifications below for alternate cable solutions	1: White with Orange stripe 2: Orange with White stripe 3: Blue with White stripe	Shielded with drain

Cable Type	Plenum Rated	Function	Wire Gauge	Primary Vendor/Part #	Alternate Vendor/Part #	Color Code	Notes
4C MS/TP	Yes	Armored Shielded	22	Belden 1269A (100 ohm)	See specifications below for alternate cable solutions	1: Red 2: Blue 3: Black 4: Yellow	Foil and braided shield with drain
4C MS/TP	Yes	Armored Shielded	22	Belden 123107A (100 ohm)	See specifications below for alternate cable solutions	1: White with Blue stripe 2: Blue with White stripe 3: White with Orange stripe 4: Orange with White stripe	Foil and braided shield with drain
4C MS/TP	Yes	Armored Shielded	24	Belden 82842 (100 ohm)	See specifications below for alternate cable solutions	1: White with Blue stripe 2: Blue with White stripe 3: White with Orange stripe 4: Orange with White stripe	Foil and braided shield with drain Low smoke
4C MS/TP	Yes	Shielded	24	Belden 82729 (100 ohm)	See specifications below for alternate cable solutions	1: White with Blue stripe 2: Blue with White stripe 3: White with Orange stripe 4: Orange with White stripe	Shield with drain
4C MS/TP	Yes	Shielded	24	Belden 88102 (100 ohm)	See specifications below for alternate cable solutions	1: White with Blue stripe 2: Blue with White stripe 3: White with Orange stripe 4: Orange with White stripe	Shield with drain

¹ Load is 96 VA when power is provided by a 100 VA transformer with external 4 amp slow blow fuse.

² Load is 100 VA when power is provided by a 100 VA transformer with internal circuit breaker.

MS/TP Specifications for Alternate Cable Solutions

1. An MS/TP EIA-485 network shall use shielded, twisted-pair cable with characteristic impedance between 100 and 130Ω
2. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pf per foot).
3. Distributed capacitance between conductors and shield shall be less than 200 pF per meter (60 pF per foot).
4. Foil or braided shields are acceptable. The maximum recommended length of an MS/TP segment is 1200 meters (4000 feet) with AWG 18 (0.82 mm² conductor area) cable.
5. The use of greater distances and/or different wire gauges shall comply with the electrical specifications of EIA-485 for MS/TP cable requirements.