



Correct Wire Splicing Techniques

When installing any electronics system, some splices may be necessary to complete the installation. Numerous or incorrectly made splices can cause a multitude of issues with electronics, including drops in voltage, RF interference, and ground faults. All of these can cause intermittent problems that are difficult to track down. To minimize the threat of these problems, splices should be kept to a minimum. PTI strongly recommends using 3M UG, UY2, and UR2 Crimp Connectors with the 3M E9Y Crimp Tool for the most effective splices. These can be ordered directly from PTI. Contact your PTI Sales Representative for more information. If you choose not to use these 3M Crimp Connectors; Wire Nuts or Dolphin Super B Crimp Connectors may be used if you are very cautious with the splices and test each splice thoroughly. We also strongly recommend that you purchase the wire for your system from PTI as we have determined the most ideal wire over years of experience and testing. Planning and installing the wiring of a site is a process that requires a high degree of technical knowledge, PTI recommends that this be done by a knowledgeable, trained professional. If you have questions, please contact our Technical Support Department by telephone at (480) 941-1513 or by email at support@ptiaccess.com. To purchase PTI Wire or 3M Crimp Connectors and the 3M E9Y Crimp Tool, contact our Sales Department by telephone at (800) 331-6224 or by email at sales@ptiaccess.com.

1. For best results, keep wire sizes and colors consistent throughout the site. Avoid switching wire colors at a splice to prevent accidental crosswiring, and to simplify future troubleshooting, maintenance, and system add-ons. We recommend using the color scheme below for PTI Remote Power and Data.

Wire Color	Assignment
Red	DC + or 12VAC
Black	DC- or 12VAC
White	Data +
Shield	Data Common
Green	Data -
Green with Black Stripe	Door Alarm Ground I
Black with Green Stripe	Door Alarm Ground II
All Striped Colors	Door Alarm +

2. Always splice wire above ground in weatherproof junction boxes. Never pull spliced or skinned wire through conduit and never splice in at or below ground level.
3. Always leave a 1 – 2 foot service loop at each splice, at each remote, and at each power supply to allow for future maintenance or repair of the splice and wire.
4. It is a good idea to pull an additional 10 feet of wire through conduit and then trim back the excess to make sure that you have enough wire to make connections without having to splice on extra.
5. Wire must not be pinched, skinned, or broken in conduit. Wire must not be run under carpet, through doorways, or in any other way that it might be damaged by furniture, traffic, etc.
6. Wire should be secured in conduit or with screw mounted zip ties to prevent wire from hanging down where it can be interfered with, crushed, pinched in doors, or otherwise damaged. Do not use adhesive mounts for zip ties as they will fail over time.
7. Wire should be kept neat and organized. It is a good idea to label wires at each junction box, splice, remote, and power supply using wire labels. Also, a note or diagram should be taped to the inside lid of each power supply or junction box showing the direction of the wires and the next access location. This simplifies future maintenance, add-ons, troubleshooting and service. It is also a good idea to keep a wiring diagram of the site secured inside the main power supply or kept with the Access System Manual at the site.

We strongly recommend that installation and setup of any PTI equipment be done by a certified, licensed, qualified, and competent person. PTI Integrated Systems can recommend local dealers and installers, but it is up to the customer to verify their qualifications and negotiate any pricing or contracts unless PTI has been specifically contracted in writing to do so for the customer. These guidelines are subject to change without notice. With any setup or configuration, some troubleshooting and adjustment of the configuration may be required. This will differ with every installation depending on many outside and site-specific variables. This troubleshooting and configuration may include purchasing additional equipment. In no circumstances will PTI Integrated Systems be responsible for any damages either incidental or consequential based on these recommendations. All installation of electronics and electrical systems must be in compliance with local, municipal, state, and National Electrical Code.

Warning – Incorrect installation of electrical components can result in damage to electronics as well as personal injury.
Warning – Cross-wiring the positive and negative or AC to DC will damage the electronics.

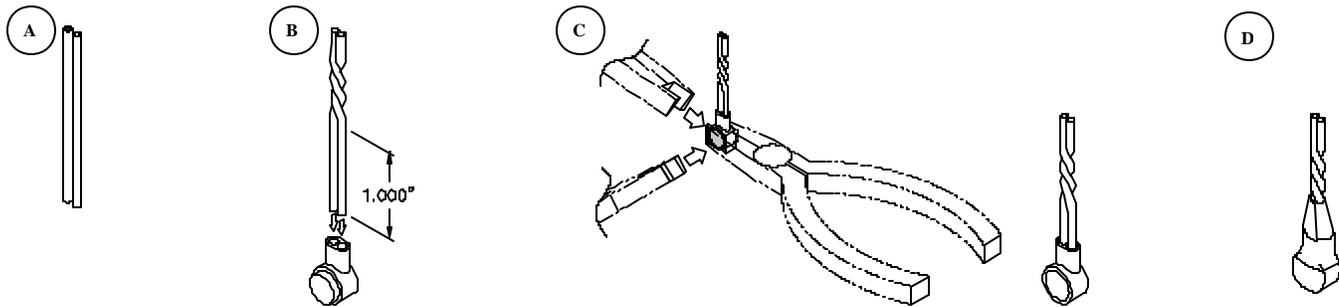


Correct Wire Splicing Techniques (Page 2)

3M UY2 Connectors

3M UY2 Connectors can be used to splice two wires from 18 – 26 awg. Each UY2 connector is self-sealing, releasing a silicone gel when crimped. Always use a 3M E9Y tool for crimping UY2 connectors. Do NOT use pliers, vice grips, hammers or other tools as these can make an incomplete crimp or break the UY2.

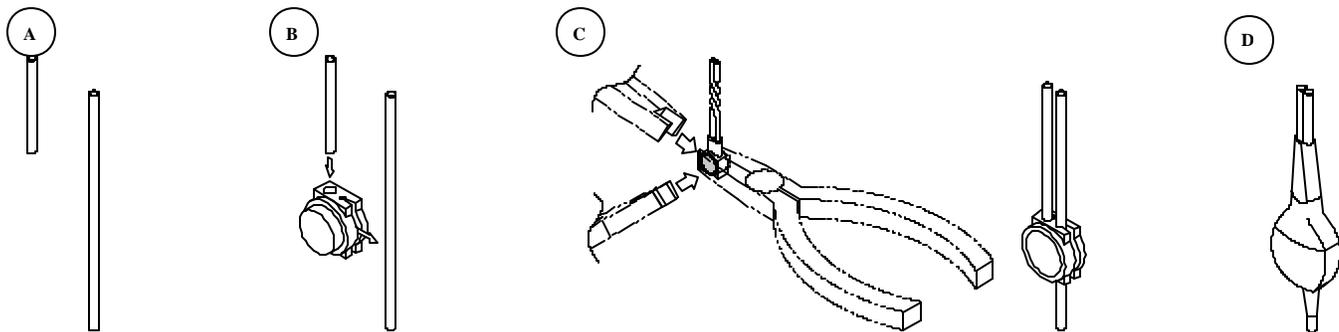
- A. Place the two wires to be spliced side by side. Do NOT strip the wires.
- B. Twist the two wires together (3 – 4 twists), leaving approximately one inch of wire past the twist. Slide each wire into one of the holes in the connector, seating the wire all the way in.
- C. Crimp the connector using a 3M E9Y tool. For best results, crimp each UY2 three times in different places around the edge of the button. This verifies that the button is evenly crimped all the way around and that it does not pop back up on one side.
- D. Seal the splice with electrical tape past the end of the UY2 down the wire to the twist.
- E. Test the splice using one of the two testing techniques in this document.



3M UG Connectors

3M UG Connectors can be used to splice a terminating wire onto a continuous wire. When installing a PTI system, this connector is generally used for connecting the ground wire from a door alarm switch to the common ground. These two wires can be 18 – 26 awg. Each UG connector is self-sealing, releasing a silicone gel when crimped. Always use a 3M E9Y tool for crimping UG connectors. Do NOT use pliers, vice grips, hammers or other tools as these can make an incomplete crimp or break the UG.

- A. Place the two wires to be spliced side by side. Do NOT strip the wires.
- B. Twist the two wires together (3 – 4 twists), leaving approximately one inch of wire past the twist. Slide each wire into one of the holes in the connector, seating the wire all the way in.
- F. Crimp the connector using a 3M E9Y tool. For best results, crimp each UG three times in different places around the edge of the button. This verifies that the button is evenly crimped all the way around and that it does not pop back up on one side.
- C. Seal the splice with electrical tape past the end of the UG down the wire about one inch on either side of the UG.
- D. Test the splice using one of the two testing techniques in this document.

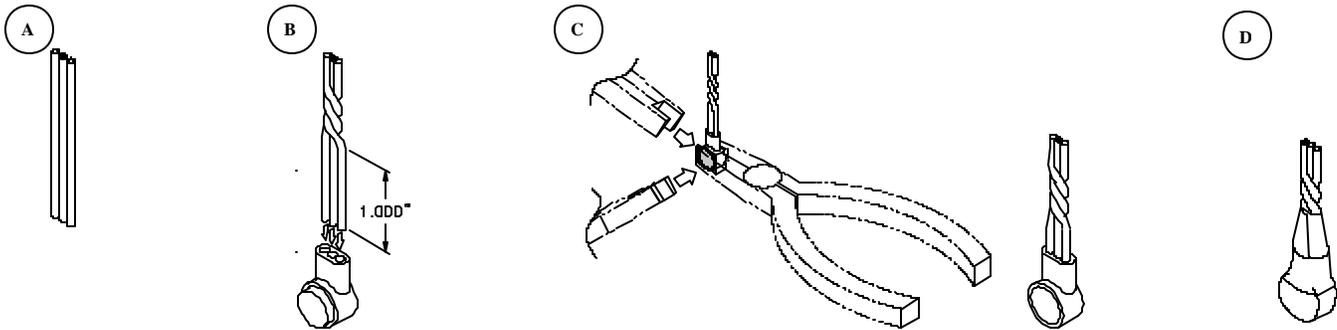


Correct Wire Splicing Techniques (Page 3)

3M UR2 Connectors

3M UR2 Connectors can be used to splice two or three wires from 18 – 26 awg. Each UR2 connector is self-sealing, releasing a silicone gel when crimped. Always use a 3M E9Y tool for crimping UR2 connectors. Do NOT use pliers, vice grips, hammers or other tools as these can make an incomplete crimp or break the UR2.

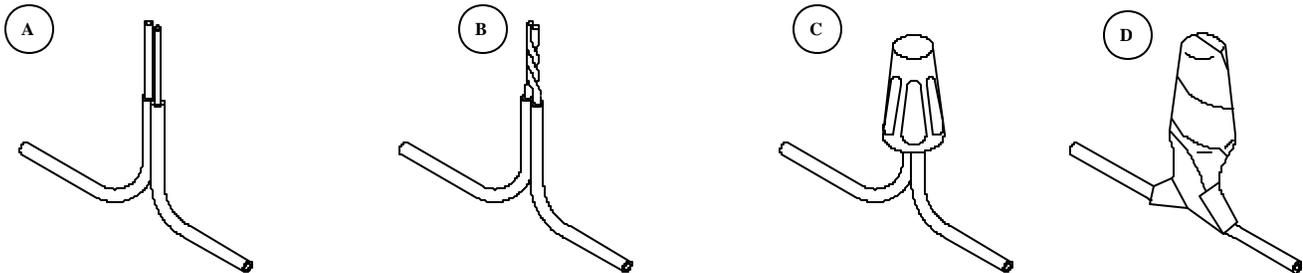
- A. Place the two or three wires to be spliced side by side. Do NOT strip the wires.
- B. Twist the wires together (3 – 4 twists), leaving approximately one inch of wire past the twist. Slide each wire into one of the holes in the connector, seating the wire all the way in.
- G. Crimp the connector using a 3M E9Y tool. For best results, crimp each UR2 three times in different places around the edge of the button. This verifies that the button is evenly crimped all the way around and that it does not pop back up on one side.
- C. Seal the splice with electrical tape past the end of the UR2 down the wire to the twist.
- D. Test the splice using one of the two testing techniques in this document.



Wire Nuts

Wire nuts can be used to splice multiple wires. Wire nuts come in many sizes, so be sure to use the correct size to fit the wires being spliced. For best results when using wire nuts, solder the wires together. Use caution when using wire nuts to make splices, as they are not as effective with low voltage power and data as 3M U-type connectors. Thoroughly test every splice made with these connectors.

- A. Place the wires to be spliced side by side. Strip the insulation from the wires back approximately ½ inch from the end.
- B. Twist the ends of the wires together (3 – 4 clockwise twists). Solder the bare wire ends together at this time if possible.
- C. Twist the wire nut onto the wires in a clockwise direction, until it seats down tightly. If it is loose or if it won't twist on, you probably have the incorrect size wire nut.
- D. Seal the splice with electrical tape past the end of the wire nut down the wire approximately one inch. Use the electrical tape to hold the wire nut firmly to the wires.
- E. Test the splice using one of the two testing techniques in this document.



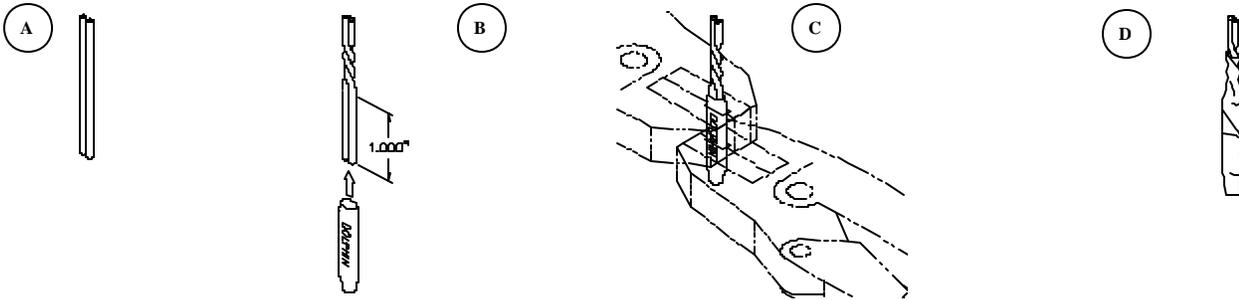


Correct Wire Splicing Techniques (Page 4)

Dolphin Super B

Dolphin Super B Connectors can be used to splice two or three wires from 16 – 24 awg. Always use a Dolphin DC-500F or Dolphin DC-4141 tool for crimping Dolphin Super B connectors. These tools can be purchased from Dolphin at www.dolphincomponents.com. Do NOT use pliers, vice grips, hammers or other tools as these can make an incomplete crimp, break the Dolphin Super B, or cut through the wires inside. Use caution when using Dolphin Super B connectors to make splices as we have found them to be less effective with low voltage power and data than 3M U-type connectors. Thoroughly test every splice made with these connectors.

- Place the two or three wires to be spliced side by side. Do NOT strip the wires.
- Twist the wires together (3– 4 twists), leaving approximately one inch of wire past the twist. Slide each wire into the large end hole of the connector, seating the wires all the way in.
- Crimp the connector using a Dolphin DC-500F or Dolphin DC-4141 tool. For best results, crimp each Dolphin Super B twice, once at the middle of the connector from one side and again at close to the wires from a different side.
- Seal the splice with electrical tape past the end of the Dolphin Super B down the wire to the twist.
- Test the splice using one of the two testing techniques in this document.





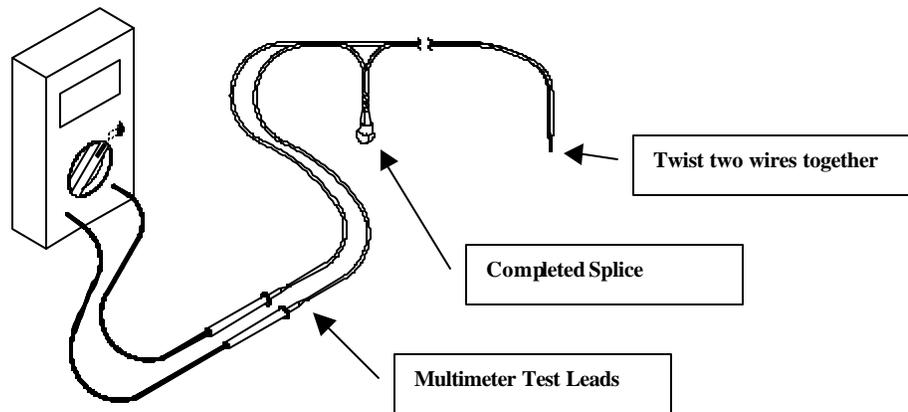
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Testing Splices

Always test a spliced line prior finalizing the access control system to help ensure reliable functionality. There are two ways to test the line. These tests require a Digital Multimeter capable of testing Ohms or Continuity and AC/DC Voltage.

Test I (Continuity or Ohms)

- Verify that there is no power or data hooked up to the wires.
- Generally wires are run in pairs (+ and – or + and Ground). Go to the nearest access point on one side of the splice (junction box or the next remote in line). Take the spliced line and one other wire and strip back the insulation approximately 1/2" from the end. Twist the two ends together.
- Go to another access point on the other side of the splice (junction box or the next remote in line).
- Set the Digital Multimeter to the Continuity or Ohms Testing Function.
- Place the one lead of the Multimeter on the spliced wire and the other lead on the other wire. The Multimeter should indicate continuity or ohms if the splice was made correctly.



Test II (Voltage)

- To test splices on the power lines, connect the entire system to power.
- Set the Digital Multimeter to AC or DC Voltage (depending on which type of power you are using).
- At each remote, touch the positive lead of the Multimeter to Pin 1 on the power terminal block.
- Touch the negative lead of the Multimeter to Pin 2 for AC powered remotes and DC powered APEX, Pin 3 for DC Keypads or Multiplexers, or Pin 6 for DC CodeXpress.
- The Multimeter should show a minimum of 12V (DC or AC) and a maximum of 18V (DC or AC) at each remote. If there is a significant drop, check the splices on that line (if any).

