MS²™ Modular Splicing System
Copper Splicing Connectors from 3M

A WORLD OF DIFFERENCE

Communication Markets Division
Core Technologies . . .

The Evolution of Copper Splicing
Core Technologies . . .

**Scotchlok™ Connectors and MS2™ Modules**

*Communication Markets Division*
3M Copper Splicing Connectors

Innovative - Reliable
40 Years of Proven Field Performance!

Communication Markets Division
Scotchlok™ Connectors

- Proven IDC technology - 40 years history
- Matched twin double elements - ensures signal integrity
- Low cost
- Specialty connectors for all wire ranges - all applications
- Trim-out without service interruption - fast, reliable repairs
- Solvent resistant - compatible with most sprays
3M Pioneered “IDC” Technology

Features:

• "U" form contact:
  • cuts through conductor insulation
  • swages conductor, removes oxide films
  • creates and maintains a gas-tight connection between IDC element and conductor

• No stripping insulation: fast, reliable wire joining

• Worldwide standard: proven reliability for 40 years, global use
Connectors are crimped with a variety of specially developed tools.
Scotchlok™ Connectors and Tools
Scotchlok™ Series I Connectors

Features:
• Full wire range: 19-26 AWG

<table>
<thead>
<tr>
<th>Connector</th>
<th>Gauge</th>
<th>Max. Insulation Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>ULG Connector</td>
<td>.5-.9 mm</td>
<td>2.08 - three wire</td>
</tr>
<tr>
<td>UR Connector</td>
<td>.4-.9 mm</td>
<td>1.67 - three wire</td>
</tr>
<tr>
<td>UY Connector</td>
<td>.4-.7 mm</td>
<td>1.52 - two wire</td>
</tr>
</tbody>
</table>
• Filled, dry/FR
• Translucent material
• Easy to use
Scotchlok™ Connectors seal out moisture, prevent corrosion, and provide solder equivalent connections.
Scotchlok™ Series II Connectors

Features:

• Matched twin double elements
• Full wire range: 19-26 AWG (.4-.9 mm)
• Large port diameters - meets all wire requirements
• Maximum insulation diameter of 2.08 mm
• Translucent material - less mistakes, easy to use
• Filled, dry and flame retardant connectors available
• Solvent resistant - bug sprays, cleaning solvents
Scotchlok™ Family

Communication Markets Division
3M connectors accept any two or three solid copper conductor combinations.
Scotchlok™ UB2A Bridge Connector

Features:

• **Interruption-free bridging**
• **Full wire range - 1 connector:**
  19-26 AWG
  .4-.9 mm
  all bridge applications
• **Inside wire retention holds wire before crimping; no errors**
Scotchlok™ Connectors seal out moisture, prevent corrosion, and provide solder equivalent connections.
Scotchlok™ 211 Trim-out Connector

Features:
• “Make before break” electrical contact:
  fast, easy, low cost repairs
  no service interruptions
  decrease maintenance expenses by 50% or more
• Pre-crimp minimizes conductor waste
• Easy test port access
• Full wire range:
  19-26 AWG (.4-.9 mm)
  maximum insulation diameter - 2.08 mm
The Scotchlok™ 211 designed specifically for interruption-free replacement of bad/failed connectors, with proven 3M IDC Technology
The Scotchlok™ 211 Trim-out Connector contains a wire cut-off blade to trim out old connectors without service interruption.
Scotchlok™ 211 Trim-Out Connector
## Scotchlok™ 211 Connector
### Typical VRS 100-pair Splice Example

<table>
<thead>
<tr>
<th></th>
<th>Discrete Connectors</th>
<th>211 Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEST</strong></td>
<td>30 minutes</td>
<td>not required</td>
</tr>
<tr>
<td><strong>ID SPECIALS</strong></td>
<td>30 minutes</td>
<td>not required</td>
</tr>
<tr>
<td><strong>SPLICE</strong></td>
<td>62 minutes</td>
<td>56 minutes</td>
</tr>
<tr>
<td><strong>TOTAL TIME</strong></td>
<td>122 minutes</td>
<td>56 minutes</td>
</tr>
</tbody>
</table>

**Discrete Connectors**

- **Loaded labor rate per hour**
  
  \[ \text{Loaded labor rate per hour} \times 2.03 \text{ hr.} = 113.68 \]

- **Material (connectors)**
  \[ \text{Material (connectors)} \times 200 \text{ ea.} = 6.00 \]

**TOTAL** = 119.68

**211 Connectors**

- **Loaded labor rate per hour**
  \[ \text{Loaded labor rate per hour} \times 0.93 \text{ hr.} = 52.08 \]

- **211 Connectors**
  \[ \text{211 Connectors} \times 200 \text{ ea.} = 12.00 \]

**TOTAL** = 64.08

**DIFFERENCE** = 52.08

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*What are interruption free repairs worth?*
Trimlok 211 Connector

Trimlok vs. Conventional Repairs per 100 pair Splice:

<table>
<thead>
<tr>
<th></th>
<th>Discrete</th>
<th>211</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 pr. splice</td>
<td>92 min’s</td>
<td>56 min’s</td>
</tr>
<tr>
<td>Identify any special circuits</td>
<td>30 min’s</td>
<td>Not needed</td>
</tr>
<tr>
<td>Total time required</td>
<td>112 min’s</td>
<td>56 min’s</td>
</tr>
<tr>
<td>Assume loaded labor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$56.00 per hour:</td>
<td>$104.00</td>
<td>$52.00</td>
</tr>
<tr>
<td>Return trouble trips:</td>
<td>4 Hrs Minimum</td>
<td>None</td>
</tr>
<tr>
<td>4 hrs. x $56.00</td>
<td>$224.00</td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>$328.00</td>
<td>$52.00</td>
</tr>
</tbody>
</table>

Total 211 Connector Savings: $276.00

- Requires no testing before trim-out or special circuit identification
- Make before break contact - no service interruptions
- Return trips required if all faults aren’t detected during first visit: conductor degradation; bad connector faults; US practice dictates more cost effective to replace all connectors on initial trouble call
557TG Drop Wire Connector

Features:

• Matched twin double elements
• Self-stripping IDC contact
• Matched twin double elements
• 16-22 AWG (.65-1.29 mm)
• Solid copper-tinned or untinned
• Maximum insulation diameter = 0.12 inches (3.0 mm)
• Sealed - insulates, provides moisture protection
• No special tools
557TG Self-Stripping Drop Wire Connector
Scotchlok™ UDW2 Drop Wire Connector

Features:
- Black molded plastic: UV resistant, no tape needed
- Gel sealant: insulates, provides moisture protection
- Full pair: ideal for inline connections in non-strain relief areas
- 16-19 AWG (.9-1.3 mm): copper or copper clad steel conductors
- Pre-crimp - holds wires before crimping
- Self-stripping, solderless fast terminations
Scotchlok™ UDW2
Drop Wire Connector
Scotchlok™ UCC & UPC Connectors

Features:
• **Plastic element**
  isolates pair
  no electrical contact
• **Gel sealant**
  clears, caps, prevents shorts
• **Red color easy to identify**
• **UPC dry version flame retardant for building wiring applications**
• **Full wire range - max insulation**
  Diameter = .06 inches (1.52 mm)
UL Listed Flame Retardant Scotchlok™ Connectors

UP3 connector

UP2 connector

UPB connector

UPC connector

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MS²™ Modular System Splicing

Communication Markets Division
MS²™ Module reduces installation time and maintenance costs for 10-, 16-, 20- and 25-pair wire jointing.
MS²™ Modular Connectors

Features:
- 10, 16, 20 and 25 Pair - connectors for all applications
- Full wire range: 19-28 AWG (.32-.9 mm)
- Maximum insulation diameter - 1.8mm
- Unique pluggable twisted “IDC” contact
- Fast, economical
- 1/2 tap
- Bridge
MS²™ Modular Connectors (continued)

Features:

- Fire retardant
- No service interruptions
- Unique, pluggable contact
Expanding on the Scotchlok™ Connector design, 3M developed the first MS²™ Module for multi-pair splicing.
MS2™ Modules provide the reliability of soldered connections plus the efficiency of multi-paired splicing
MS²™ Family

3M Communication Markets Division
MS²™ 25-pair Super-Mini Module

Features:

- 22-28 AWG (.32-.65 mm), max. insul. diam. 1.65 mm
- Accepts MS² 4005-DPM module
- External test access
- Removable, transparent cover and base
- IDC element
- Simple, fast, accurate, low cost splicing
MS\textsuperscript{2} 25-pair Super-Mini Module (continued)

- Full wire range for most wire diameters
- Lower inventory cost
- Full bridging capability
- Fast pair identification
- Easy bridge access and repair
- Make before break contact; no service interruptions
MS²™ 25-pair Super-Mini Module (continued)
MS²™ 4005-DPM Super Mate Module

Features:
• Pluggability enables full interruption-free transfers and 1/2 taps
• Mates to existing MS² 4000D splice modules for bridging applications
• Mates to itself for pluggable splices and bridges
• Allows preconnectorization of apparatus
• No cutting & resplicing conductors
• Pluggable splices provide complete plant flexibility
4005-DPM Module Body
Super Mate/Super-Mini

Communication Markets Division
MS²™ 16-pair Super Mate Module

Features:
- Developed specifically for central office equipment interruption free transfers
- Fast cutovers transparent to customers
- Reversible for fail-safe installations
- Pluggable splices provide complete central office equipment flexibility
MS²™ 4005-DPM/16-pair Fire Retardant Module
MS²™ 9700-10 Module
MS²™ 9700 10-pair Module

Features:
• Full wire range - 19-26 AWG (.35-.9 mm)
• Maximum insulation diameter - 1.8 mm
• Internal strain relief insures mechanical integrity for all insulation types
• Reduced bundle size saves money
• Light weight tools are easy to use
MS²™ 9700-10 10-pair Super-Mini Splicing Module
Features:

- Full wire range - 20-26 AWG (.4-.8 mm); maximum insulation diameter of 1.8 mm
- Connector meets all common wire ranges
- Pluggable system
- Mates to 9700 splice modules for bridging applications
- Mates to itself for pluggable splices and bridges
- Allows preconnectorization of apparatus
- Pluggable splices provide complete plant flexibility
MS²™ 9705 10-pair DPM Module provides gas-tight connections for up to 10 pairs of wire.
MS²™ Inline Extension Tool
MS²™ 9002 20-pair Splice Module

Features:

• Specifically designed for grease filled cable jointing
• Full wire range 20-28 AWG (.32-.8 mm)
• Maximum insulation diameter 1.65 mm
• 1/2 tap option
• Low cost, fast, inline wire jointing
• Air core or filled applications
MS²™ 4005 DPM/BTP Bottom Test Plug Jumper

Features:

• Designed specifically for accessing top wire in an existing 4005 DPM/4000 D Bridge configuration
• NO service interruptions
• Preterminated 2 ft. (50.8 mm) sheathed cable
• BTP allows plugging to bottom of the 4000 D connector
• Easy test access
MS²™ 4005-DPM/BTP
Bottom Test Plug
MS²™ Sealant Box

Features:

• MS²™ 4000 D Modules with moisture protection
  • Completely fills, protects and seals the module
  • Prevents splice encapsulants from filling test entry ports
  • Future reentry and re-arrangements are fast and simple even after splice encapsulation

• Applicator tool
  • Forces sealant through the wire channels and test entry ports
  • Insures complete module encapsulation
• Snap over latches
  – secures the connector in the sealant box
  – ensures connector is fully inserted in the box
• Prepackaged DWP 4000 D Module and sealant box in a kit for all MS²™ 4000 module family splice applications
MS²™ 4000-DWP Module with Sealant Box
MS²™ Sealant Boxes
MS²™ 9700-DWP 10-pair Super-Mini Module with Sealant Box
3M™ MS²™ Modular System
Splicing Tools & Accessories
4045-K Splicing Rig Kit

Communication Markets Division
4021-M2 Splicing Rig Kit
MS²™ 4049 Lite Rig
MS²™ 4049 Lite Rig (Inside View)
MS²™ 4036-25 Hand Hydraulic Crimper
MS²™ Pluggable Module Hand Tools
MS²™ 4026-A Module Maintenance Kit
4048-SAB1 Super-Mini Test Probe Kit
MS²™ 9721 Rig Kit
MS²™ 9755 Lightweight Rig
3M - Proven “System” Connector Technology!

- Proven 3M IDC technology
- 40 years proven field reliability
- Spring energy, self-stripping IDC “U” elements provide gas tight, solder equivalent connections
- Highest quality materials/processes ensure signal integrity for today and the future
- Clear plastic covers/bases allow easy visual inspections
- Moisture and corrosion resistant
- Interruption free test/transfers
- 50% saving in maintenance and rehab work
(continued)

- Defacto industry standard
- Global technical service
- 6 sigma quality - all ISO 9002 manufacturing facilities
- Craft friendly
- Field tested under all conditions
- Simple low cost tooling
- Extensive global customer referral base
- Multiple sources of supply
3M™ Copper Connectors

- Moisture resistant, encapsulated, dry and flame retardant options
- Custom packaging options
- Sealant boxes for best moisture protection
- Clearing and capping connectors
- Testing during and after splicing w/o circuit interruption
- Tools for all special applications
Comments from Nordic Telco on Non-3M Look-Alike Module Manufactures

- “They have no tools to the 25-pair system”
- “We will not use “Company X” whatsoever”
- “They have no sales support”
- “We will not take a chance to mix a “copied product” in the network”
- “The quality of 3M has been excellent and the price of failures is too critical and must be avoided”
Typical Construction/Rehab Project

- Cost per line ranges from $1000-$1500
  - @ $1000
  - Central Office: $100
  - Cable: $500
  - Infrastructure: $200
  - Accessories: $200

- Each line has 10-25 connection points - 15 Average
- Assume a module at $1 to $1.25

<table>
<thead>
<tr>
<th>Cost</th>
<th>Cost/Line</th>
<th>%ACC</th>
<th>%Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.00</td>
<td>$0.60</td>
<td>0.30</td>
<td>0.060</td>
</tr>
<tr>
<td>$1.25</td>
<td>$0.75</td>
<td>0.37</td>
<td>0.075</td>
</tr>
</tbody>
</table>

- Replacement costs for faulty connectors is usually underestimated & hidden
- Closure + Connector + Infrastructure + Lost Revenue
  - $50.00 + 0.05 + $20.00 + $10.00

TOTAL COST OF REPAIR PER LINE = $80.05 ( )
3M™ Copper Splicing Technology

Why even risk using non-3M “look-alike” connectors?

Can you Afford to buy Only a connector?