



iS³ Harness

Technical Specification

Release 1.00

PROPRIETARY INFORMATION

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Approvals

| <i>NAME</i> | <i>TITLE</i> | <i>SIGNATURE</i> | <i>DATE</i> |
|----------------|--------------------------|------------------|-------------|
| Pierre Richard | Hardware Design Engineer | | |
| | | | |

1. Control Sheet

| <i>RELEASE</i> | <i>DATE</i> | <i>COMMENT</i> | <i>AUTHOR</i> |
|----------------|-------------|----------------|----------------|
| 1.00 | 03/06/06 | First release | Pierre Richard |

2. Purpose

This document is intended to provide the necessary information to design and manufacture the required cable harnesses for the iS³.

3. Detailed Description

This section provides the necessary cabling information for each connector used on the iS³.

3.1 Back plate input/output connectors

The iS³ is equipped with four default input/output connectors on its back plate: J1, J2, J3 and J4. These connectors are mounted on the iS³ main board.

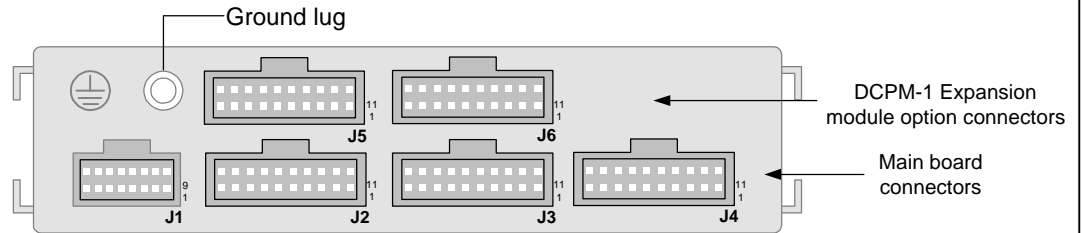
The iS³ can be optionally equipped with one in a variety¹ of input/output expansion module options which adds supplementary connector(s) on the iS³ back plate:

- The optional DCPM-1 input/output expansion module option adds two connectors on the iS³ back plate: J5 and J6.

The six-iS³ back plate connectors are presented in the following drawing:

¹ More input/output expansion module options will be available in the future (note that only one such module at a time can be accommodated in an iS³).

iS3 back panel overview



| No. | DESCRIPTION | REQ. | MULTITEL | A | DATE: | RELEASE: |
|---------------------------------------|-------------------|--------------|----------------|---|-------|----------|
| B.1 | Complete revision | P.R. | | | | |
| iS ³ - Back panel overview | | | | | | |
| | | DESIGNED BY: | DRAWING No: | | | SHEET: |
| | | C.A. / C.B. | SD_IS3_B-1.VSD | | | 1 OF 10 |

This section provides the necessary cabling information for each connector used on the iS³ back plate. It includes information on J5 and J6, which is only applicable for the DCPM-1 input/output expansion module option.

3.1.1 General wiring specification

- Recommended wire type:
 - solid
 - unshielded
 - bundled in cables or loose wires
- Recommended wire gauge: AWG #20 through 22
- Wire maximum insulation outside diameter: 1.27mm (0.05 inch)
- Wire maximum wall thickness: 0.38mm (0.015 inch)
- Recommended wire flammability rating:
 - UL: VW-1
 - CSA: FT-4
- Wire minimum electrical insulation: 100 VDC
- Wire insulation material: Polyvinyl chloride or polytetrafluoroethylene.
- Cable connectors: A complete set of connectors and covers (for J1 through J6) is supplied with each iS³.

3.1.2 J1 connector on iS³ main board

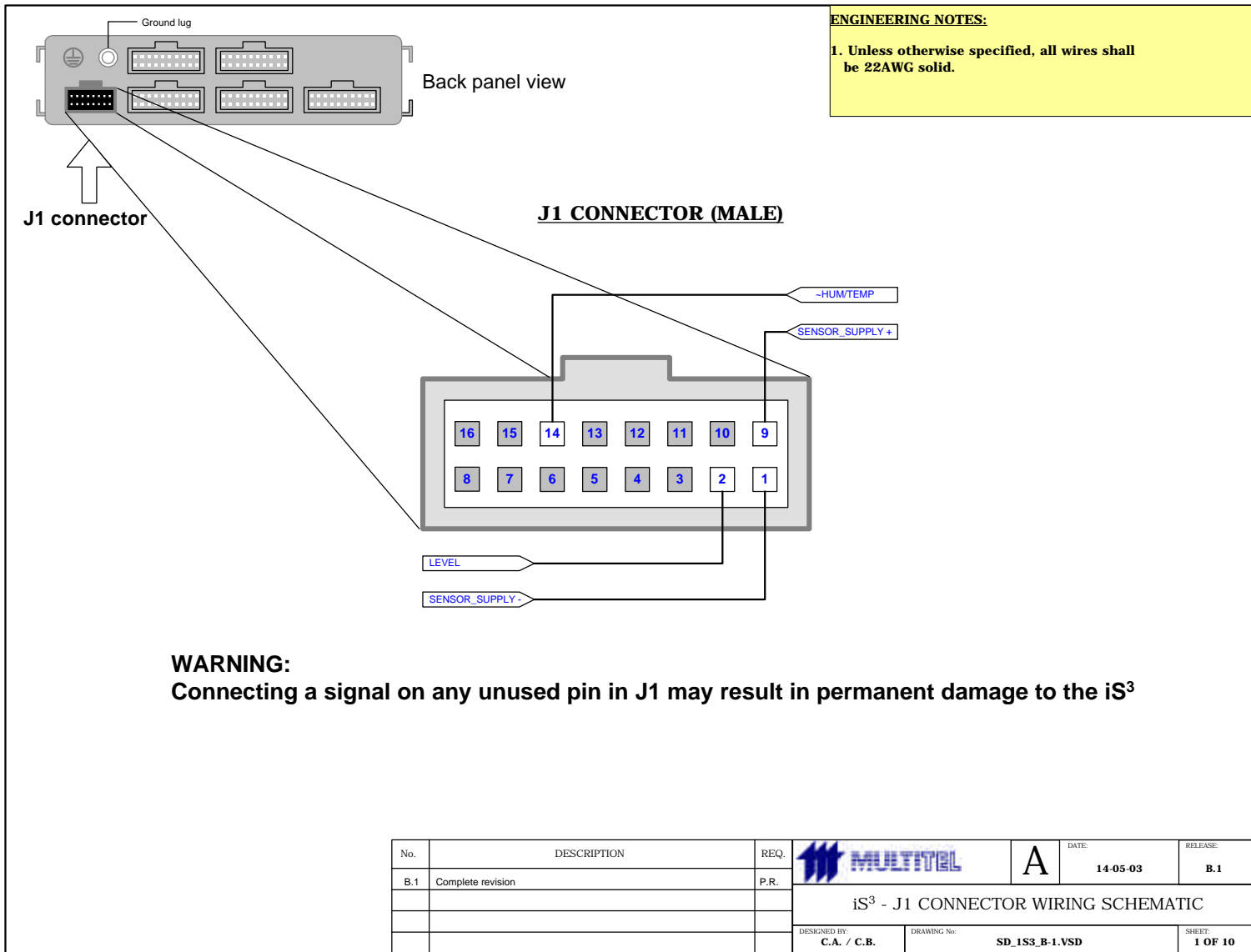
- Connector layout:
 - Humidity sensor.
- Cable connector type: 2 x 8 dual (16 pins row) 2.54mm (0.100 inch) spacing:
 - Connector: AMP² 102448-6
 - Top half cover: AMP 102681-3
 - Bottom half cover: AMP 102536-6
- Maximum wiring length: 10.6 meters (35 feet)
- Wiring information:

| Signal Name | Pin number | Wire type | Fusing |
|----------------|------------|---------------------------|--------|
| SENSOR_SUPPLY+ | 9 | 4 single wires in a cable | N/A |
| SENSOR_SUPPLY- | 1 | | N/A |
| LEVEL | 2 | | N/A |
| ~HUM/TEMP | 14 | | N/A |
| NO CONNECTION | 3 | N/A | N/A |
| NO CONNECTION | 4 | N/A | N/A |
| NO CONNECTION | 5 | N/A | N/A |
| NO CONNECTION | 6 | N/A | N/A |
| NO CONNECTION | 7 | N/A | N/A |
| NO CONNECTION | 8 | N/A | N/A |
| NO CONNECTION | 10 | N/A | N/A |
| NO CONNECTION | 11 | N/A | N/A |
| NO CONNECTION | 12 | N/A | N/A |
| NO CONNECTION | 13 | N/A | N/A |
| NO CONNECTION | 15 | N/A | N/A |
| NO CONNECTION | 16 | N/A | N/A |

NOTE: The: “~HUM/TEMP” signal should be wired from the iS³ to its humidity sensor even though it is reserved for future use.

WARNING: Connecting a signal on any unused (“NO CONNECTION”) pin in J1 may result in permanent damage to the iS³.

² The manufacturer of these parts is AMP/Tyco Electronics.



3.1.3 J2 connector on iS³ main board

- Connector layout:
 - Power
 - Logic ground
 - 2 binary outputs (alarms) form-C outputs
 - 8 binary voltage level detector inputs.
- Cable connector type: 2 x 10 dual (20 pins row) 0.100 inch spacing:
 - Connector: AMP³ 102448-8
 - Top half cover: AMP 102681-5
 - Bottom half cover: AMP 102536-8
- Maximum length: 300 meters (984 feet)
- Wiring information:

| Signal Name | Pin number | Wire type | Fusing |
|--------------|------------|--------------|----------------|
| BINARY 1 | 14 | Single wire | 1/2A slow blow |
| BINARY 2 | 4 | Single wire | 1/2A slow blow |
| BINARY 3 | 13 | Single wire | 1/2A slow blow |
| BINARY 4 | 3 | Single wire | 1/2A slow blow |
| BINARY 5 | 12 | Single wire | 1/2A slow blow |
| BINARY 6 | 2 | Single wire | 1/2A slow blow |
| BINARY 7 | 11 | Single wire | 1/2A slow blow |
| BINARY 8 | 1 | Single wire | 1/2A slow blow |
| BATTERY+ | 19 | Twisted pair | 1/2A slow blow |
| BATTERY+ | 20 | | |
| BATTERY- | 9 | Twisted pair | 1/2A slow blow |
| BATTERY- | 10 | | |
| LOGIC_GROUND | 8 | Twisted pair | N/A |
| LOGIC_GROUND | 18 | | |
| MAJOR_NO | 5 | Twisted pair | See NOTE 5 |
| MAJOR_NC | 7 | | See NOTE 5 |
| MAJOR_COM | 6 | Single wire | See NOTE 5 |
| MINOR_NO | 15 | Twisted pair | See NOTE 5 |
| MINOR_NC | 17 | | See NOTE 5 |
| MINOR_COM | 16 | Single wire | See NOTE 5 |

NOTE 1: Two separate wires (twisted pair) shall be routed together for the “BATTERY+” signal and shall be connected together at the source. The same shall be done for “BATTERY-“ and “LOGIC_GROUND” signals.

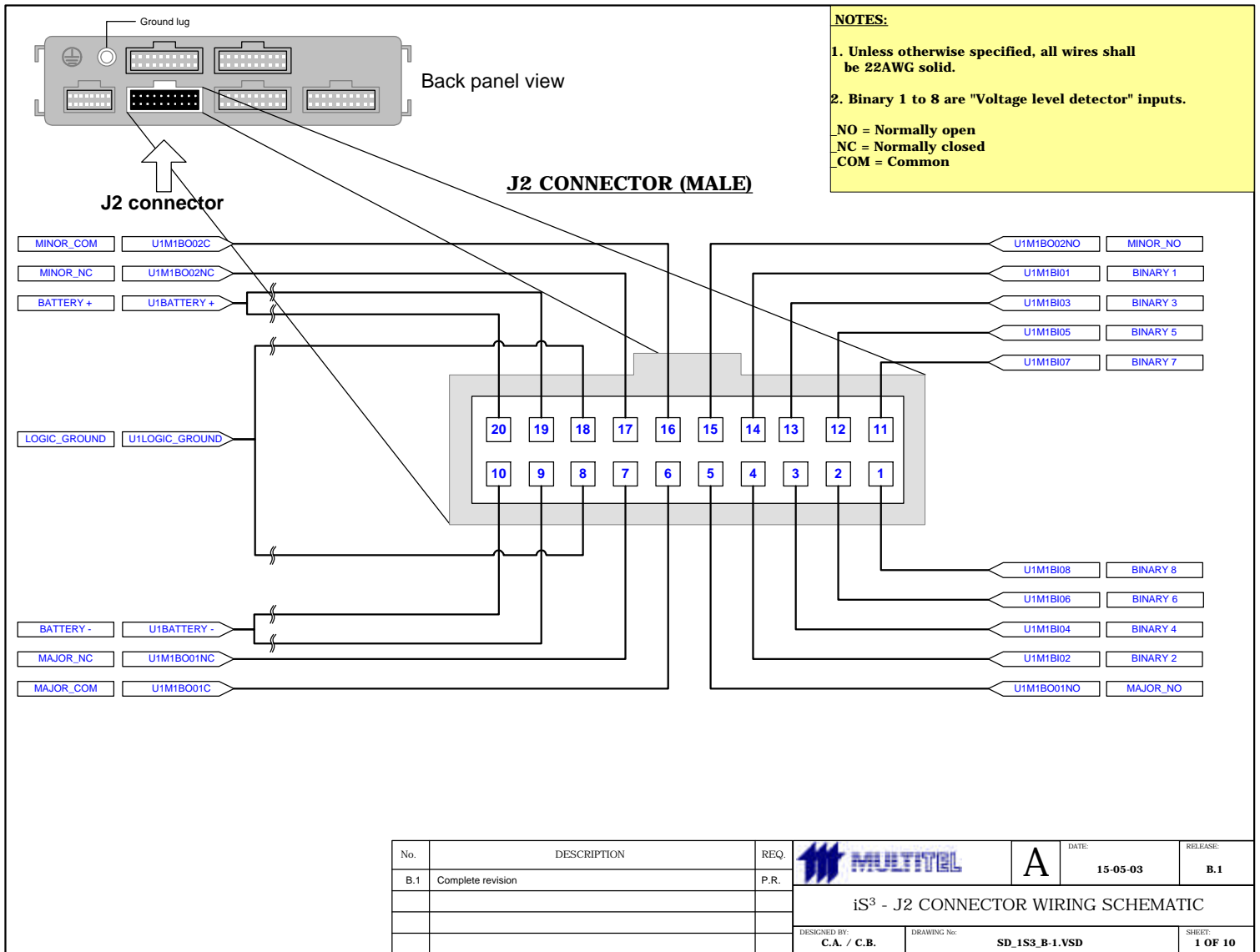
NOTE 2: Powering a 24 Vdc iS³ on a 48 Vdc supply may result in permanent damage or unit malfunction.

NOTE 3: If the iS³ is powered from –48 VDC then fuse the “BATTERY-“ signal. If the iS³ is powered from +24 VDC then fuse the “BATTERY+“ signal instead.

NOTE 4: The number of twists per foot for all twisted pairs used to wire the iS³ does not matter.

NOTE 5: A 1/2A slow blow fuse shall be used for all relay outputs on any battery voltage (-48 or +24 VDC) connected signal.

³ The manufacturer of these parts is AMP/Tyco Electronics.



3.1.4 J3 connector on iS³ main board

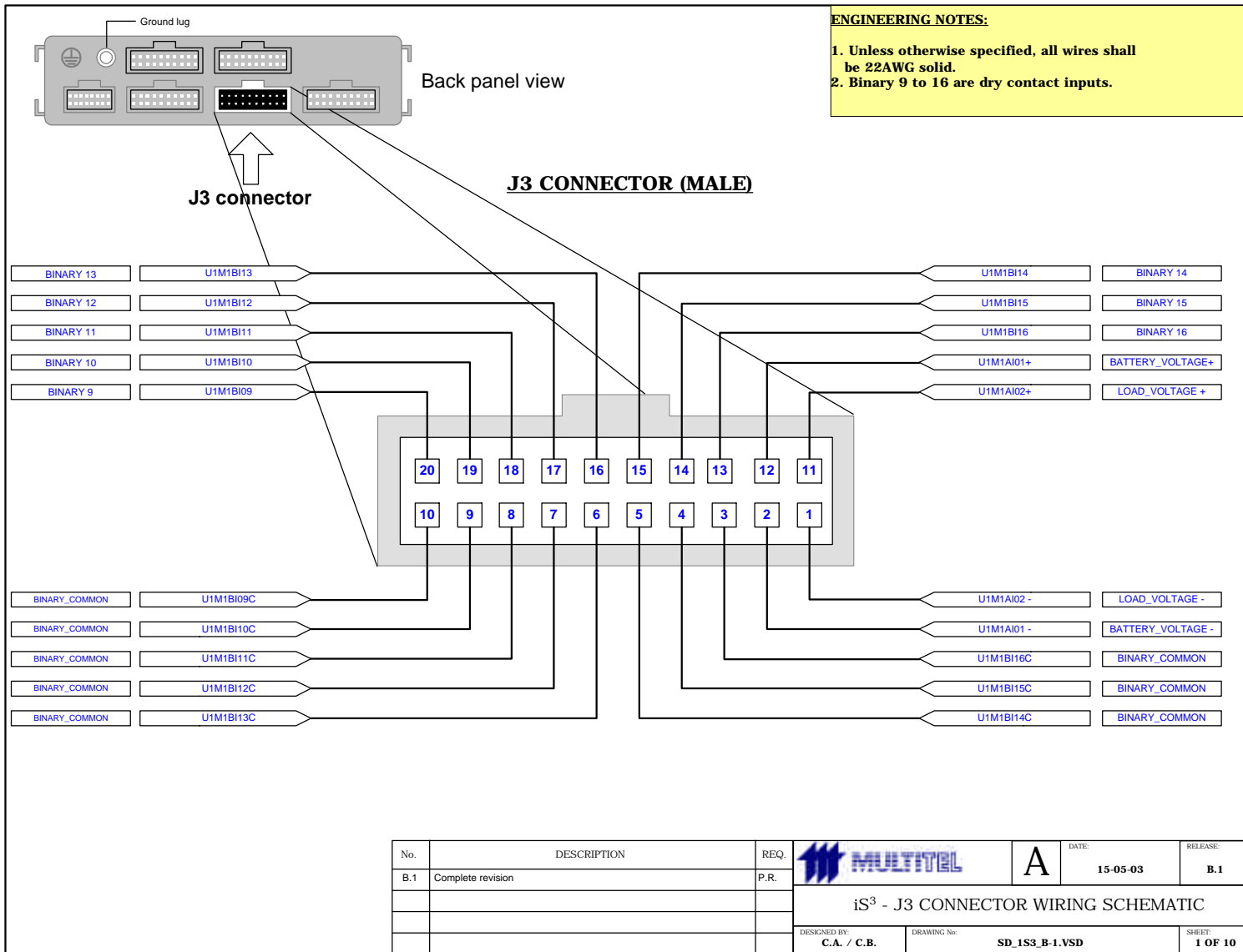
- Connector layout:
 - 2 battery voltage inputs
 - 8 binary contact closure (dry contact) inputs.
- Cable connector type: 2 x 10 dual (20 pins row) 0.100 inch spacing:
 - Connector: AMP⁴ 102448-8
 - Top half cover: AMP 102681-5
 - Bottom half cover: AMP 102536-8
- Maximum length: 300 meters (984 feet)
- Wiring information:

| Signal Name | Pin number | Wire type | Fusing |
|------------------|------------|--------------|----------------|
| BATTERY_VOLTAGE+ | 12 | Twisted pair | 1/2A slow blow |
| BATTERY_VOLTAGE- | 2 | | |
| LOAD_VOLTAGE+ | 11 | Twisted pair | 1/2A slow blow |
| LOAD_VOLTAGE- | 1 | | |
| BINARY 9 | 20 | Twisted pair | N/A |
| BINARY_COMMON | 10 | | |
| BINARY 10 | 19 | Twisted pair | N/A |
| BINARY_COMMON | 9 | | |
| BINARY 11 | 18 | Twisted pair | N/A |
| BINARY_COMMON | 8 | | |
| BINARY 12 | 17 | Twisted pair | N/A |
| BINARY_COMMON | 7 | | |
| BINARY 13 | 16 | Twisted pair | N/A |
| BINARY_COMMON | 6 | | |
| BINARY 14 | 15 | Twisted pair | N/A |
| BINARY_COMMON | 5 | | |
| BINARY 15 | 14 | Twisted pair | N/A |
| BINARY_COMMON | 4 | | |
| BINARY 16 | 13 | Twisted pair | N/A |
| BINARY_COMMON | 3 | | |

NOTE 1: The iS3 cannot normally measure a -48V plant voltage when powered in +24V and vice-versa (without introducing an important measurement error). The iS3 voltage inputs are calibrated according to its operating voltage. In an application where both battery voltages co-exist it could be possible, on a special order, to calibrate specific voltage channels to be connected to -48 Vdc and others on +24 Vdc. These channels must then be connected to the voltage they were calibrated for, or else important measurement errors will occur.

NOTE 2: If the monitored battery voltage ground is positive on this channel then fuse the “BATTERY_VOLTAGE-“ signal. If the monitored battery voltage ground is negative on this channel then fuse the “BATTERY_VOLTAGE+“ signal instead. The same shall be done for “LOAD_VOLTAGE-“ and “LOAD_VOLTAGE+“ signals.

⁴ The manufacturer of these parts is AMP/Tyco Electronics.



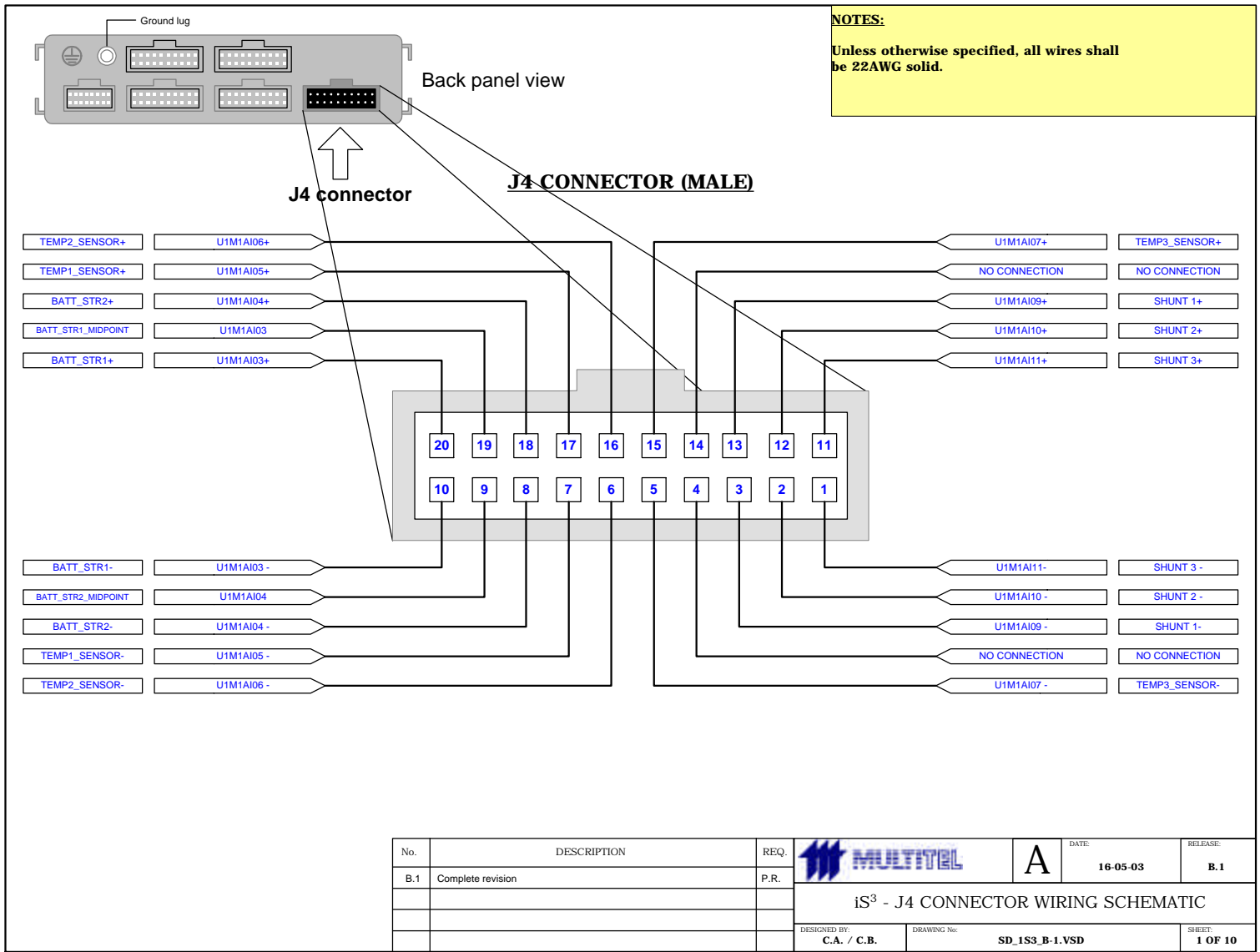
3.1.5 J4 connector on iS³ main board

- Connector layout:
 - 2 battery midpoint-voltage inputs
 - 3 temperature sensor inputs
 - 3 battery current inputs.
- Cable connector type: 2 x 10 dual (20 pins row) 0.100 inch spacing:
 - Connector: AMP⁵ 102448-8
 - Top half cover: AMP 102681-5
 - Bottom half cover: AMP 102536-8
- Maximum length: 300 meters (984 feet)
- Wiring information:

| Signal Name | Pin number | Wire type | Fusing |
|--------------------|------------|--------------|----------------|
| SHUNT 1+ | 13 | Twisted pair | 1/2A slow blow |
| SHUNT 1- | 3 | | 1/2A slow blow |
| SHUNT 2+ | 12 | Twisted pair | 1/2A slow blow |
| SHUNT 2- | 2 | | 1/2A slow blow |
| SHUNT 3+ | 11 | Twisted pair | 1/2A slow blow |
| SHUNT 3- | 1 | | 1/2A slow blow |
| TEMP1_SENSOR+ | 17 | Twisted pair | N/A |
| TEMP1_SENSOR- | 7 | | N/A |
| TEMP2_SENSOR+ | 16 | Twisted pair | N/A |
| TEMP2_SENSOR- | 6 | | N/A |
| TEMP3_SENSOR+ | 15 | Twisted pair | N/A |
| TEMP3_SENSOR- | 5 | | N/A |
| BATT_STR1+ | 20 | Single wire | 1/2A slow blow |
| BATT_STR1_MIDPOINT | 19 | Single wire | 1/2A slow blow |
| BATT_STR1- | 10 | Single wire | 1/2A slow blow |
| BATT_STR2+ | 18 | Single wire | 1/2A slow blow |
| BATT_STR2_MIDPOINT | 9 | Single wire | 1/2A slow blow |
| BATT_STR2- | 8 | Single wire | 1/2A slow blow |
| NO CONNECTION | 14 | N/A | N/A |
| NO CONNECTION | 4 | N/A | N/A |

NOTE: The midpoint "+" signal connection must always be connected to BRG. In a -48 Vdc system, BRG is positive meaning the midpoint "+" signal shall be connected to the battery positive post. In a +24 Vdc system, BRG is negative meaning the midpoint "+" signal shall be connected to the battery negative post. The midpoint "-" signal connection must always be connected to the battery. In a -48 Vdc system, the battery is negative meaning the midpoint "-" signal shall be connected to the battery negative post. In a +24 Vdc system, the battery is positive meaning the midpoint "-" signal shall be connected to the battery positive post. Whatever the battery voltage and polarity, the midpoint signal lead must always be connected to the battery midpoint. Therefore, when measuring midpoint voltages on +24 Vdc systems, the midpoint "BATT_STR1+" signal shall be connected to BRG, the midpoint "BATT_STR1-" shall be connected to +24 Vdc and the midpoint signal lead shall be connected to the battery midpoint. The same also applies to the other midpoint signals on the iS3: BATT_STR2 on the iS3 main board and BATTERY_STRING3, BATTERY_STRING4 and BATTERY_STRING5 on the DCPM-1 expansion board.

⁵ The manufacturer of these parts is AMP/Tyco Electronics.



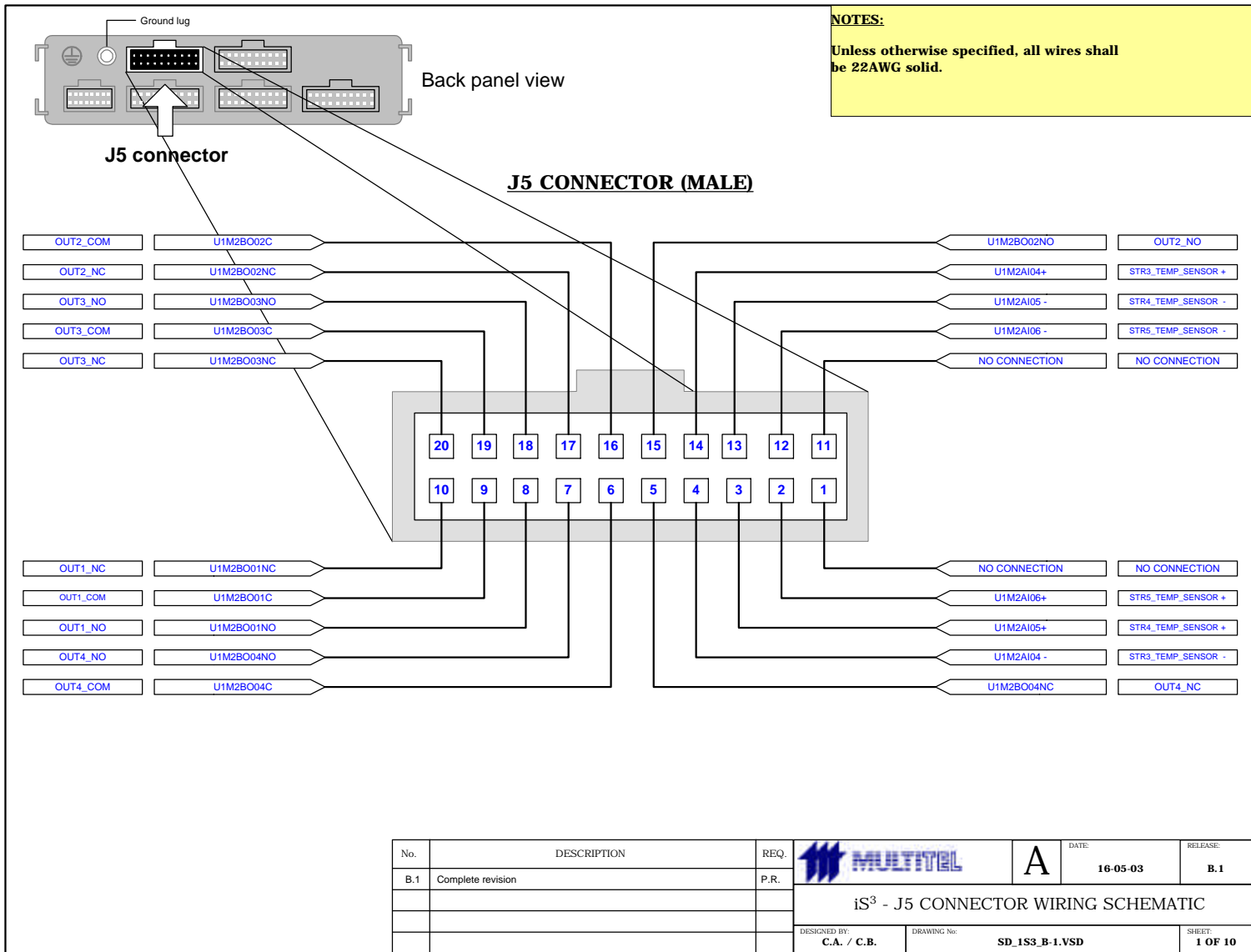
3.1.6 J5 connector on iS³ DCPM-1 expansion module option

- Connector layout:
 - 4 binary outputs (alarms) form-C outputs
 - 3 temperature sensor inputs.
- Cable connector type: 2 x 10 dual (20 pins row) 0.100 inch spacing:
 - Connector: AMP⁶ 102448-8
 - Top half cover: AMP 102681-5
 - Bottom half cover: AMP 102536-8
- Maximum length: 300 meters (984 feet)
- Wiring information:

| Signal Name | Pin number | Wire type | Fusing |
|-------------------|------------|--------------|----------|
| STR3_TEMP_SENSOR+ | 14 | Twisted pair | N/A |
| STR3_TEMP_SENSOR- | 4 | | N/A |
| STR4_TEMP_SENSOR+ | 3 | Twisted pair | N/A |
| STR4_TEMP_SENSOR- | 13 | | N/A |
| STR5_TEMP_SENSOR+ | 2 | Twisted pair | N/A |
| STR5_TEMP_SENSOR- | 12 | | N/A |
| OUT1_NO | 8 | Twisted pair | See NOTE |
| OUT1_NC | 10 | | See NOTE |
| OUT1_COM | 9 | Single wire | See NOTE |
| OUT2_NO | 15 | Twisted pair | See NOTE |
| OUT2_NC | 17 | | See NOTE |
| OUT2_COM | 16 | Single wire | See NOTE |
| OUT3_NO | 18 | Twisted pair | See NOTE |
| OUT3_NC | 20 | | See NOTE |
| OUT3_COM | 19 | Single wire | See NOTE |
| OUT4_NO | 7 | Twisted pair | See NOTE |
| OUT4_NC | 5 | | See NOTE |
| OUT4_COM | 6 | Single wire | See NOTE |
| NO CONNECTION | 11 | N/A | N/A |
| NO CONNECTION | 1 | N/A | N/A |

NOTE: A 1/2A slow blow fuse shall be used for all relay outputs on any battery voltage (-48 or +24 VDC) connected signal.

⁶ The manufacturer of these parts is AMP/Tyco Electronics.



3.1.7 J6 connector on iS³ DCPM-1 expansion module option

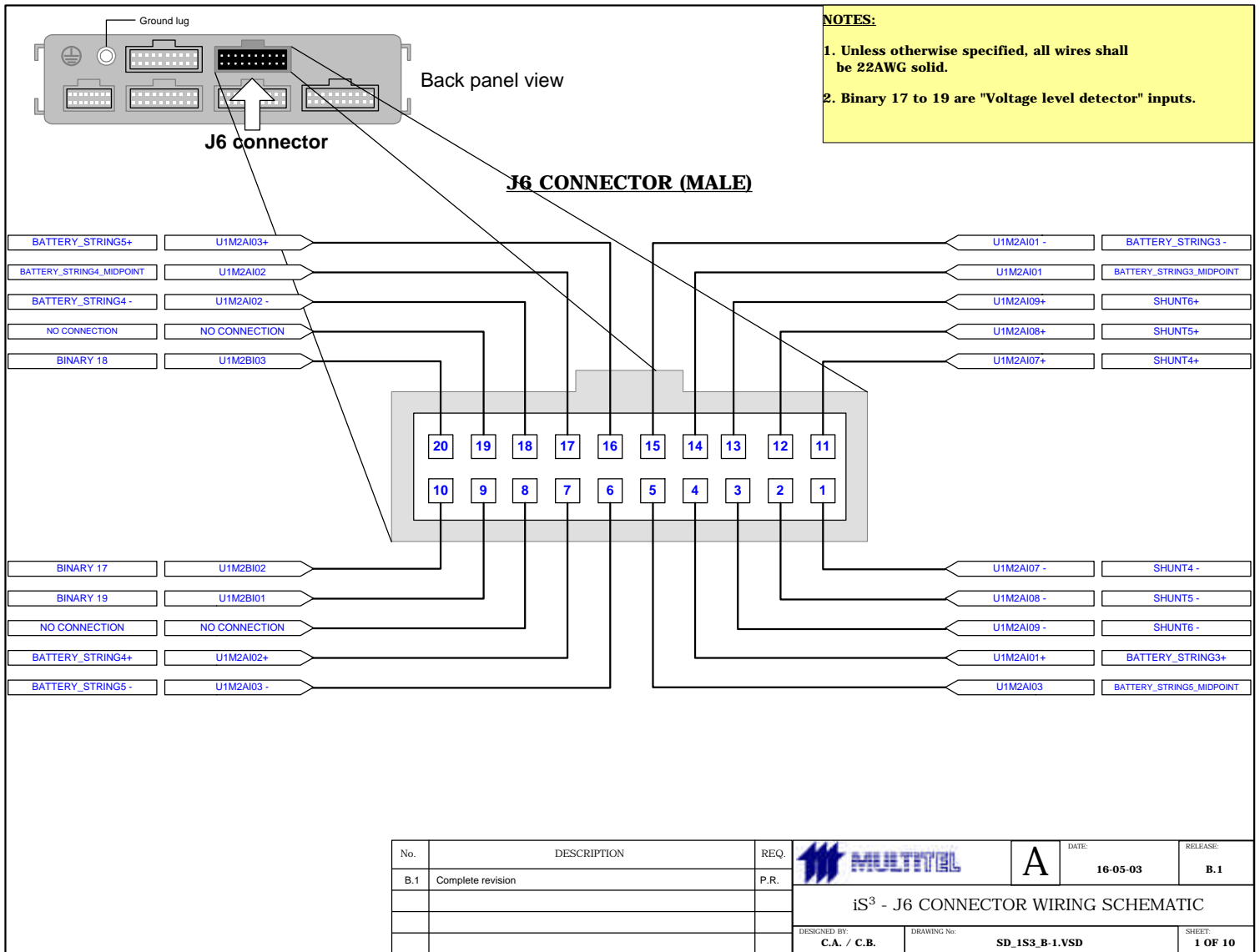
- Connector layout:
 - 3 binary voltage level detector inputs
 - 3 battery midpoint-voltage inputs
 - 3 battery current inputs.
- Cable connector type: 2 x 10 dual (20 pins row) 0.100 inch spacing:
 - Connector: AMP⁷ 102448-8
 - Top half cover: AMP 102681-5
 - Bottom half cover: AMP 102536-8
- Maximum length: 300 meters (984 feet)
- Wiring information:

| Signal Name | Pin number | Wire type | Fusing |
|--------------------------|------------|--------------|----------------|
| SHUNT 4+ | 11 | Twisted pair | 1/2A slow blow |
| SHUNT 4- | 1 | | 1/2A slow blow |
| SHUNT 5+ | 12 | Twisted pair | 1/2A slow blow |
| SHUNT 5- | 2 | | 1/2A slow blow |
| SHUNT 6+ | 13 | Twisted pair | 1/2A slow blow |
| SHUNT 6- | 3 | | 1/2A slow blow |
| BINARY 17 | 10 | Single wire | 1/2A slow blow |
| BINARY 18 | 20 | Single wire | 1/2A slow blow |
| BINARY 19 | 9 | Single wire | 1/2A slow blow |
| BATTERY_STRING3+ | 4 | Single wire | 1/2A slow blow |
| BATTERY_STRING3_MIDPOINT | 14 | Single wire | 1/2A slow blow |
| BATTERY_STRING3- | 15 | Single wire | 1/2A slow blow |
| BATTERY_STRING4+ | 7 | Single wire | 1/2A slow blow |
| BATTERY_STRING4_MIDPOINT | 17 | Single wire | 1/2A slow blow |
| BATTERY_STRING4- | 18 | Single wire | 1/2A slow blow |
| BATTERY_STRING5+ | 16 | Single wire | 1/2A slow blow |
| BATTERY_STRING5_MIDPOINT | 5 | Single wire | 1/2A slow blow |
| BATTERY_STRING5- | 6 | Single wire | 1/2A slow blow |
| NO CONNECTION | 19 | N/A | N/A |
| NO CONNECTION | 8 | N/A | N/A |

NOTE 1: Shunt channels are only present on “DCPM-1 3SH” expansion module option (not present on “DCPM-1”).

⁷ The manufacturer of these parts is AMP/Tyco Electronics.

NOTE 2: The midpoint "+" signal connection must always be connected to BRG. In a -48 Vdc system, BRG is positive meaning the midpoint "+" signal shall be connected to the battery positive post. In a +24 Vdc system, BRG is negative meaning the midpoint "+" signal shall be connected to the battery negative post. The midpoint "-" signal connection must always be connected to the battery. In a -48 Vdc system, the battery is negative meaning the midpoint "-" signal shall be connected to the battery negative post. In a +24 Vdc system, the battery is positive meaning the midpoint "-" signal shall be connected to the battery positive post. Whatever the battery voltage and polarity, the midpoint signal lead must always connected to the battery midpoint. Therefore, when measuring midpoint voltages on +24 Vdc systems, the midpoint "BATT_STR1+" signal shall be connected to BRG, the midpoint "BATT_STR1-" shall be connected to +24 Vdc and the midpoint signal lead shall be connected to the battery midpoint. The same also applies to the other midpoint signals on the iS3: BATT_STR2 on the iS3 main board and BATTERY_STRING3, BATTERY_STRING4 and BATTERY_STRING5 on the DCPM-1 expansion board.



| No. | DESCRIPTION | REQ. | MULTITEL | A | DATE: | RELEASE: |
|---|-------------------|----------------|----------|---------|----------|----------|
| B.1 | Complete revision | P.R. | | | 16-05-03 | B.1 |
| iS³ - J6 CONNECTOR WIRING SCHEMATIC | | | | | | |
| DESIGNED BY: | | DRAWING No: | | SHEET: | | |
| C.A. / C.B. | | SD_1S3_B-1.VSD | | 1 OF 10 | | |

3.1.8 Connector crimping information

- Manual crimping tool handle assembly: AMP 58074-1
- Manual crimping tool head: AMP 58062-1

For detailed information on the connector crimping technique and other relative information, refer to the appendix of this document.

WARNING: Two different crimping tool head versions seem to exist with the same part number. One accepts a large range of wiring outer diameter while the other only accepts a more limited range of smaller wires.

3.1.9 Fuse information

For power input, a fuse and an unattached in-line fuse holder is supplied with each iS³.

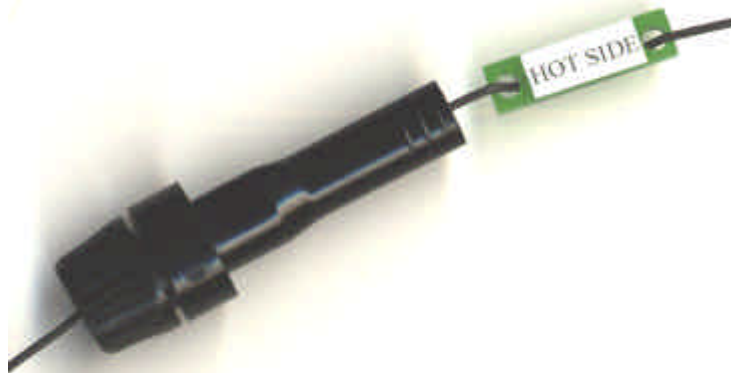
3.1.9.1 Fuse

Besides power input, many signals on the iS³ need to be protected by external fuses (since they are connected to live battery voltages). Slow blow cartridge (tubular) or other fuse types should be used. The following cartridge (tubular) fuse part numbers are recommended (equivalents can also be used):

- Littelfuse: 313.500 (1/2A 250V)
- Belfuse: 3SB500 (1/2A 250V)

3.1.9.2 Power supply fuse holder

The Multitel supplied power supply in-line fuse holder bears a clear "HOT SIDE" indication on one of its wire. This sign prevents this internal contact from coming out of the in-line fuse holder insulating body whenever a fuse is changed (fuse holder opened). Removal of this sign could result in unprotected short-circuits to surrounding electrically connected metal which would melt wiring and possibly start a fire. The other wire does not provide such protection. Therefore, the "HOT SIDE" labelled wire should be connected to -48 or +24 Vdc.



Multitel supplied in-line fuse holder with "HOT SIDE" indication

3.2 Front plate communication connectors

The iS³ is equipped with two default communication connectors on its front plate:

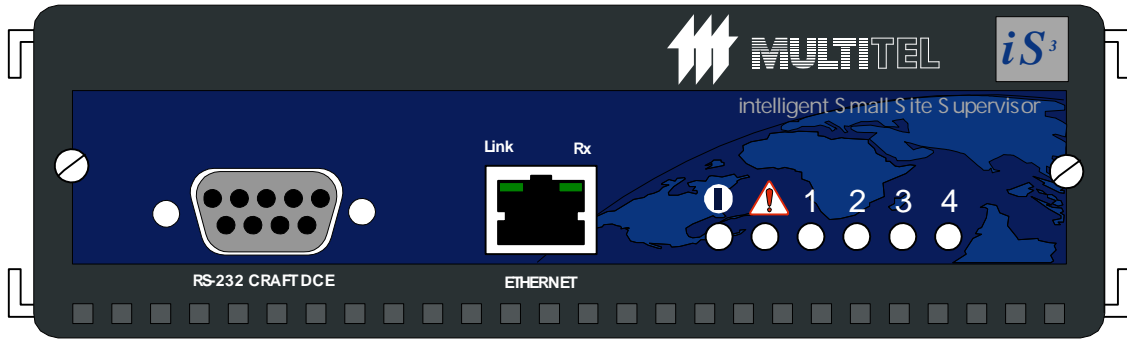
- Female RJ-45 connector for Ethernet and
- Female DB9 for RS-232 craft DCE port.

These connectors are mounted on the iS³ main board.

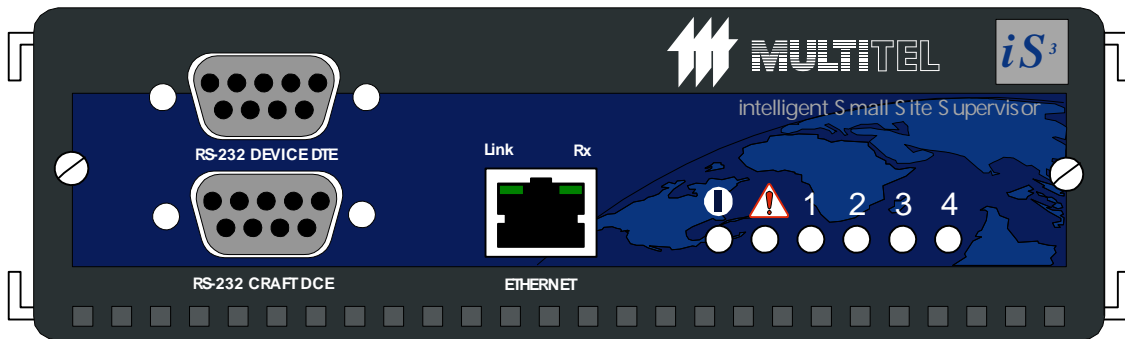
The iS³ can be optionally equipped with one in a variety of communication expansion module options which adds one supplementary connector on the iS³ front plate:

- The optional RS-232 DEVICE DTE communication expansion module adds another female DB9 connector.
- The optional modem communication expansion module adds a female RJ-11 connector.

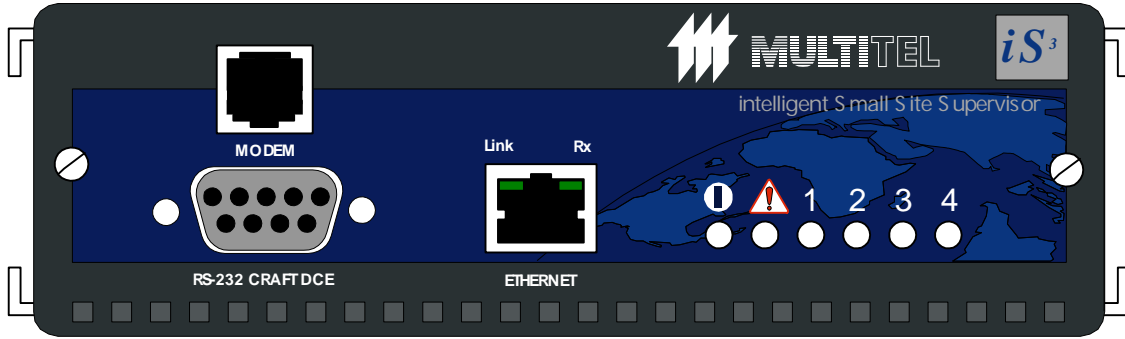
This section provides the necessary cabling information for each connector used on the iS³ front plate. It includes information on the RS-232 DEVICE DTE connector, which is only applicable for the RS-232 DEVICE DTE communication expansion module option. It also includes information on the RJ-11 connector, which is only applicable for the modem communication expansion module option. The four possible connectors are presented in the following three drawings:



iS³ standard front plate with default connectors



iS³ front plate with RS-232 DEVICE DTE communication expansion module option connector



iS³ front plate with modem communication expansion module option connector

3.2.1 Standard Ethernet port

- Cable connector type: male plastic unshielded RJ-45 for solid wire
- Bit rate: 10 mbps
- Maximum cable length: 100 meters (328 feet)
- Cable types:
 - To connect to a hub or switch: standard, straight through, unshielded, 4 twisted pairs UTP CAT5, solid, RJ-45 male to RJ-45 male cable.
 - To connect directly to a PC: standard, **cross cable**, unshielded, 4 twisted pairs UTP CAT5, solid, RJ-45 male to RJ-45 male cable.
- Wiring information (for connector mounted on the iS³):

| Signal Name | Pin number |
|-------------------------------|------------|
| TXB+ (Transmit positive side) | 1 |
| TXB- (Transmit negative side) | 2 |
| RXB+ (Receive positive side) | 3 |
| NO CONNECTION | 4 |
| NO CONNECTION | 5 |
| RXB- (Receive negative side) | 6 |
| NO CONNECTION | 7 |
| NO CONNECTION | 8 |

3.2.2 Standard RS-232 CRAFT DCE port

- Cable connector type: Shielded male DB9 connector
- Maximum bit rate: 115.2 kbps
- Maximum cable length:

| Maximum cable length | Data rate [bps] |
|-----------------------|------------------|
| 2.5 meters (8 feet) | 115,200 (115.2K) |
| 5.0 meters (16 feet) | 57,600 (57.6K) |
| 7.5 meters (25 feet) | 38,400 (38.4) |
| 15 meters (50 feet) | 19,200 (19.2K) |
| 30 meters (100 feet) | 9,600 (9.6K) |
| 60 meters (200 feet) | 4,800 (4.8K) |
| 120 meters (400 feet) | 2,400 (2.4K) |

- Cable type: standard straight through⁸, shielded, 9 conductor, DB9 male to DB9 female cable.
- Wiring information (for connector mounted on the iS³):

| Signal Name | Pin number |
|---------------------------|------------|
| DCD (Data Carrier Detect) | 1 |
| TXD (Transmit Data) | 2 |
| RXD (Receive Data) | 3 |
| DSR (Data Set Ready) | 4 |
| GND (Ground) | 5 |
| DTR (Data Terminal Ready) | 6 |
| CTS (Clear To Send) | 7 |
| RTS (Request To Send) | 8 |
| RI (Ring Indicator) | 9 |

3.2.3 Optional RS-232 DEVICE DTE port

- Cable connector type: Shielded male DB9 connector
- Maximum bit rate: 115.2 kbps
- Maximum cable length:

| Maximum cable length | Data rate [bps] |
|-----------------------|------------------|
| 2.5 meters (8 feet) | 115,200 (115.2K) |
| 5.0 meters (16 feet) | 57,600 (57.6K) |
| 7.5 meters (25 feet) | 38,400 (38.4) |
| 15 meters (50 feet) | 19,200 (19.2K) |
| 30 meters (100 feet) | 9,600 (9.6K) |
| 60 meters (200 feet) | 4,800 (4.8K) |
| 120 meters (400 feet) | 2,400 (2.4K) |

- Cable types:
 - To connect to a PC: standard, 9 conductor, DB9 male to DB9 female, “RS-232 null-modem” plus standard, straight through, shielded, 9 conductor, DB9 male to DB9 female cable.
 - To connect to an external modem: standard straight through, shielded, 9 conductor, DB9 male to DB25 male cable. The cable connections shall match the following table:

| Signal Name | DB9 pin number | DB25 pin number |
|---------------------------|----------------|-----------------|
| DCD (Data Carrier Detect) | 1 | 8 |
| RXD (Receive Data) | 2 | 3 |
| TXD (Transmit Data) | 3 | 2 |
| DTR (Data Terminal Ready) | 4 | 20 |
| GND (Ground) | 5 | 7 |
| DSR (Data Set Ready) | 6 | 6 |
| RTS (Request To Send) | 7 | 4 |
| CTS (Clear To Send) | 8 | 5 |
| RI (Ring Indicator) | 9 | 22 |

⁸ Use a straight through cable when connecting the iS³ RS-232 CRAFT DCE port to a standard PC serial port.

WARNING: Do not use RS-232 DB9 male to DB9 male gender-changers in permanent installations since their pin lengths are insufficient for reliable connections. Furthermore, gender-changers do not guarantee shield continuity since no screws are available on them to maintain the connector firmly in place.

- Wiring information (for connector mounted on the iS³):

| Signal Name | Pin number |
|---------------------------|------------|
| DCD (Data Carrier Detect) | 1 |
| RXD (Receive Data) | 2 |
| TXD (Transmit Data) | 3 |
| DTR (Data Terminal Ready) | 4 |
| GND (Ground) | 5 |
| DSR (Data Set Ready) | 6 |
| RTS (Request To Send) | 7 |
| CTS (Clear To Send) | 8 |
| RI (Ring Indicator) | 9 |

3.2.4 Optional Modem port

- Cable connector type: male plastic 4 positions RJ-11 for flat cables
- Maximum bit rate: 33.6 kbps
- Maximum cable length: Limited by loop current greater or equal to 20 milliamperes
- Cable type: standard, 4 wire telephone RJ-11 male to RJ11 male flat cable
- Wiring information:

| Signal Name | Pin number |
|---------------|------------|
| NO CONNECTION | 1 |
| RING OF PSTN | 2 |
| TIP OF PSTN | 3 |
| NO CONNECTION | 4 |

4. List of Abbreviations & Glossary

AWG: American Wire Gauge
 CAT: Category
 CSA: Canadian Standards Association
 DCE: Data Communication Equipment
 DCPM: DC (Direct Current) Power plant Monitor
 DTE: Data Terminal Equipment
 iS³: intelligent Small Site Supervisor
 kbps: kilobits per second
 mbps: megabits per second
 PC: Personal Computer
 PSTN: Public Switched Telephone Network
 UL: Underwriter's Laboratory
 UTP: Unshielded Twisted Pair
 VDC: Volts DC (Direct Current)

5. Appendix: J1-J6 supplementary crimping information



AMP AMPMODU⁺ Mass Termination (MT)
Interconnection System

Application Specification

114-25032

12 DEC 00 Rev B

NOTE All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters [and inches]. Unless otherwise specified, dimensions have a tolerance of ± 0.13 [$\pm .005$] and angles have a tolerance of $\pm 2^\circ$. Figures and illustrations are for identification only and are not drawn to scale.

1. INTRODUCTION

This specification covers the requirements for application of AMP[®] AMPMODU MT Interconnection System for wire-to-printed circuit (pc) board applications. This system consists of receptacle and right angle pin header connectors. These connectors have a double row of contact cavities with row-to-row and in-row contact spacing on 2.54×2.54 [$.100 \times .100$] centerlines. The receptacles are available pre-loaded with standard pressure insulation displacement contacts in 6 through 64 positions or high pressure insulation displacement contacts in 6 through 20 positions. The receptacles are also available unloaded with 6 through 64 positions which accept standard pressure or high pressure insulation displacement contacts. Each receptacle is marked at the mating end with position one identifier.

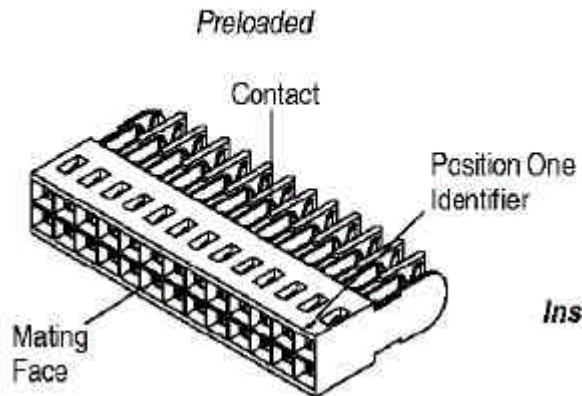
NOTE Unloaded receptacles will also accept crimp snap-in contacts if a larger wire insulation outside diameter or two-wire circuit application is required. Contact the Product Information Center at the number at the bottom of this page for recommendations.

The receptacle contact cavities each feature a locking lance window for positive polarization for inserting contacts. A front and back cover must be installed onto the receptacle to protect the terminated wires and contacts. The covers are available in low profile and standard profile.

The pin headers are available in 6, 8, 10, 16, 18, 20, 26, and 50 positions and contain 0.64 [.025] square post through hole solder type contacts for pc board applications. These pin headers have an effective contact post length of 6.93 [.273]. The housing features standoffs to allow easy pc board cleaning after soldering. No tooling is required for placement of the pin headers onto the pc board.

When corresponding with personnel, use the terminology provided in this specification to facilitate your inquiries for information. Basic terms and features of this product are provided in Figure 1.

Receptacle Connector



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TOOLING ASSISTANCE CENTER 1-800-722-1111
AMP FAX/PRODUCT INFO 1-800-522-5752

1 of 20
LOC B

2.6. Instructional Material

Instruction Sheets (408-series) provide assembly instructions and Customer Manuals (409-series) provide machine setup and operation procedures. Documents available which pertain to this product are:

A. Product

408-6532 AMPMODU MT Connectors

B. Tooling

408-6574 Ribbon Cable Cutting Hand Tool 91220-1
408-6789 Pistol Grip Pneumatic Handle Assembly 58075-1
408-6790 Pistol Grip Manual Handle Assembly 58074-1
408-6837 Hand Crimping Tool 91410-1
408-6923 Manual Arbor Frame Assembly 58024-1
408-6927 Design Recommendations for PC Board Support Fixture
408-7763 Pneumatic Applicator Frame Assembly 91112-2
408-7777 Manual Arbor Frame Assembly 91085-2
408-8083 Ferrule Applicator Assembly 812407-1
408-9028 Tooling Assembly 91411-2
408-9085 Terminating Head 58062-1
408-9138 Pneumatic Upper Tool Mount 527145-1 and Discrete Wire Organizer Assembly 527085-1
408-9393 Pneumatic Power Bench Assembly 58338-1
408-9453 Extraction/Lance Reset Tool 843477-3
408-9454 Keying Tool 843853-1
408-9515 Ribbon Cable Notcher 854449-[]
408-9678 Tooling Kit 1-762661-0
408-9687 Adapter Kit 854468-[] for Ribbon Cable Notcher 854449-[]
409-5128 AMP-O-ELECTRIC* Model "K" Terminator Machines 565435-5 and 2-565435-2
409-5746 Electric Power Unit 931800-1
409-5839 CHAMPOMATOR* 2.5 Bench Terminating Machine 354786-[]
409-5843 2700-lb Pneumatic Power Unit 312522-1

3. REQUIREMENTS

3.1. Safety

Do not stack component packages so high that the shipping containers buckle or deform.

3.2. Limitations

Connector assemblies are designed to operate in a temperature range of -65° to 105°C [-85° to 221°F].

3.3. Material

The connector housings are made of flame retardant thermoplastic. The insulation displacement contacts (of receptacles) are made of copper alloy underplated with nickel, contact area is plated with gold, and crimp area is plated with tin-lead. Square post contacts (of pin headers) are made of copper alloy plated with gold over nickel. The covers are made of flame retardant thermoplastic. The shielding is made of pre-tinned copper alloy and shield ferrule is made of soft copper plated with tin. Keying plugs are made of nylon.

3.4. Storage

A. Ultraviolet Light

Prolonged exposure to ultraviolet light may deteriorate the chemical composition used in the connector housing material.

B. Shelf Life

The connectors should remain in the shipping containers until ready for use to prevent deformation to the connectors. The connectors should be used on a first in, first out basis to avoid storage contamination that could adversely affect performance.

C. Chemical Exposure

Do not store connectors near any chemical listed below as they may cause stress corrosion cracking in the connectors.

| | | | | | |
|----------|------------|----------|-----------------|----------|------------------|
| Alkalies | Ammonia | Citrates | Phosphates | Citrates | Sulfur Compounds |
| Amines | Carbonates | Nitrites | Sulfur Nitrites | | Tartrates |

3.5. Cable and Discrete Wire Selection and Preparation

A. Selection

The contacts accept solid or stranded discrete wire, unshielded or shielded jacketed cable, or 1.27 [.050] or 2.54 [.100] centerline ribbon cable with wire size range of 30 through 20 AWG (for discrete wire) and 28 through 22 AWG (for ribbon cable), and maximum insulation outside diameter of 1.27 [.050] and maximum wall thickness of 0.38 [.015]. Jacketed cable must have an outside diameter range of 4.32 through 15.2 [.170 through .600], and the shield must be braided (foil cannot be used). Individual wire insulation must be made of polyvinylchloride or polytetrafluoroethylene.

NOTE

For cable containing more than seven-strand wire, or for other insulation materials, contact the Product Information Center at the number at the bottom of page 1 for recommendations.

B. Preparation

There is no preparation required for discrete wire. Proper strip length for jacketed cable is necessary to properly insert individual wires into the contact. The strip length of jacketed cable is shown in Figure 3. After stripping, the cable braid must be slightly flared.

CAUTION

Reasonable care must be taken not to nick, scrape, or cut individual wire insulation during the stripping operation.

Ribbon cable must be cut perpendicular to the length of the cable, then individual wires separated to the dimensions shown in Figure 4.

C. Cover

Each receptacle requires a front and a back cover.

The cover installed onto the receptacle must meet the following requirements. Refer to Figure 7.

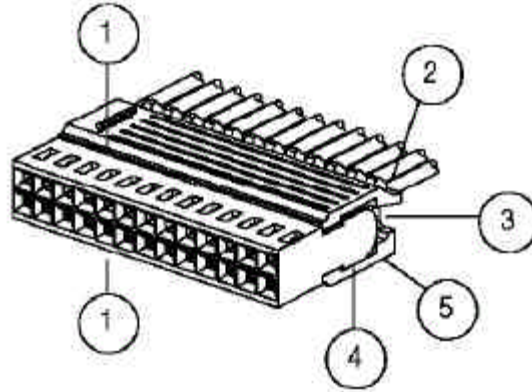
1. The tabs on the front and back covers are inserted into the back of the receptacle contact cavities.
2. For covers with locating posts, each slot must contain the appropriate wire. For covers with locking latches, wires must be within the locking latches.

NOTE

Each slot for the low profile shielding and non-shielding back cover must only contain a maximum of two wires.

3. The cover locking latches or locating posts fully engage each other.
4. There are no wires pinched between the receptacle and the covers.

Non-Polarizing and Shielding Covers Shown



3.12. Mating and Unmating Connectors

The force required to mate connectors is provided in Figure 17.

A. Mating

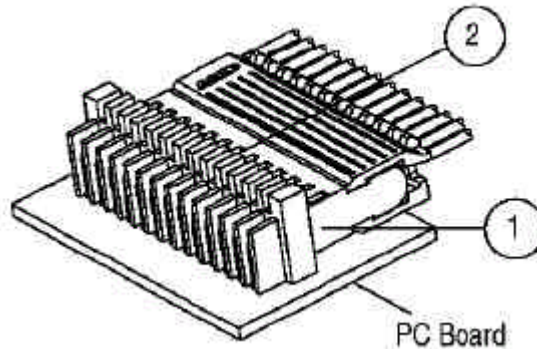
Mated unshielded connectors must conform to the following requirements. Refer to Figure 17.

1. Position 1 of the receptacle is matched with Position 1 of the pin header.
2. The receptacle must be fully bottomed on the pin header.

B. Unmating

The connectors must be unmated by rocking them apart. It is recommended that one end should be free, but should not be pulled more than 5° before rocking the same end back. This will release the opposite end, and the connectors will be separated. The force required to unmate connectors is provided in Figure 17.

Mated Unshielded Connectors



| APPLICATION | CONNECTOR CONTACT TYPE | MATING FORCE (Max) PER CONTACT (N [oz]) | UNMATING FORCE (Min) PER CONTACT (N [oz]) |
|-------------|------------------------|---|---|
| Unshielded | Standard Pressure | 2.50 [9] | 0.42 [1.5] |
| | High Pressure | 7.23 [26] | 1.39 [5] |

3.13. Strain Relief and Wire Dress

If required, discrete wires can be bundled together and supported with cable ties. Wires must not be stretched or confined in any way that would cause strain on the contacts. Therefore, the wires must remain perpendicular to the receptacle and avoid an excessively sharp bend radius. The minimum distance required before bending or forming wires, and the minimum distance required for location of the cable tie (measured from the wire end of the receptacle), is shown in Figure 18.

CAUTION Do not bend unsupported wires as this may cause strain on the contacts.

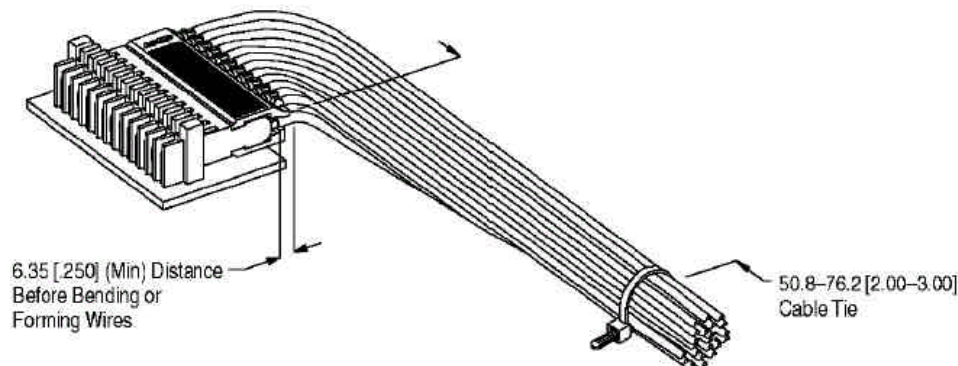


Figure 18

4. QUALIFICATION

AMPMODU MT Interconnection connectors are Listed by Underwriters Laboratories Inc. (UL) under File E28476, and Certified to Canadian Standards Association (CSA) under File LR 7189.

5. TOOLING

Tooling part numbers and instructional material packaged with the tooling are shown in Figure 19.

NOTE No tools are required to install receptacle covers, pin header shields, or keying plugs.

5.1. Cable Preparation Tools

The ribbon cable cutting hand tool makes a perpendicular cut across ribbon cable. The ribbon cable notching tool separates individual wires of 2.54 [.100] centerline ribbon cable to a specified length. The notching tool must be installed onto an arbor frame assembly, machine, or power unit. Tooling contained in adapter kits must be installed onto the notching tool to be used with the terminator machine or pneumatic power unit.

NOTE Commercial tools are available for slitting 1.27 [.050] centerline ribbon cable.

5.2. Arbor Frames

The arbor frame assemblies provide the necessary force to drive tooling to be used for a specific purpose. The assemblies are available as manually-operated and actuated by a handle or pneumatically-powered and actuated by a foot switch. These assemblies are designed to be bench mounted and provide for low to medium volume production.

5.3. Terminating Tools

A. Hand Held Assemblies

The pistol grip handle assemblies provide the necessary force to drive a terminating head designed to terminate the receptacles. The terminating head must be installed onto the assembly. The assemblies are available as manually-operated or pneumatically-powered, both actuated by a trigger. The pneumatic assembly is designed to allow the head to be rotated.

NOTE A hand tool package is available that consists of the manual handle assembly and terminating head.

B. Bench Mounted Assembly

The power bench assembly provides the necessary force to drive a terminating head designed to terminate the receptacles. The terminating head must be installed onto the assembly. This assembly is pneumatically-powered and actuated by a foot switch. The assembly can be mounted according to operator preference and desired eject direction of the terminated receptacle.

C. Hand Crimping Tool

The hand crimping tool consists of a handle assembly with a head that accepts a specific die assembly. This tool has a ratchet that ensures full crimping pressure is applied to the ferrule used with the shielding for receptacles.

5.4. Tooling

A. Adapter Kits

These kits contain tooling that enables the ribbon cable notcher to be used with the terminating machine or pneumatic power unit.

B. Die Assemblies

These die assemblies feature crimping chambers designed to crimp the ferrule onto the cable braid and shield cable outlet. A die assembly must be installed onto the hand crimping tool or ferrule applicator assembly.

C. Terminating Head

This head terminates discrete wires onto the connectors using the insulation displacement technique. The head must be installed onto a handle assembly or power unit.

NOTE

A hand tool package is available that consists of the terminating head and manual handle assembly.

D. Tooling Assembly and Tooling Kit

The tooling assembly and tooling kit contain the necessary tooling to position the connector and wires for proper termination. The tooling assembly is used to mass terminate discrete wire, jacketed cable, or ribbon cable, and must be installed onto an arbor frame assembly. The tooling kit is used to terminate discrete wire and jacketed cable and must be installed onto a terminating machine.

E. Upper Tool Mount and Discrete Wire Organizer Assembly

This tooling must be installed onto the tooling assembly when used with the pneumatic applicator frame. The discrete wire organizer assembly must be installed onto the manual arbor frame assembly when terminating discrete wires.

F. Ferrule Applicator Assembly

This applicator assembly must be installed onto a power unit, and a specific die assembly must be installed onto the applicator assembly to crimp the ferrule used with the shielding for receptacles.

5.5. Power Units

A. Electric Machine

This electrically-powered machine provides the necessary action to power a terminating head to terminate receptacle onto discrete wire using the insulation displacement technique. The terminating head must be installed onto the machine. This machine is foot switch actuated and designed to be bench mounted.

B. Pneumatic Machine

This pneumatically-powered machine provides the necessary force to drive the ribbon cable notcher. An adapter kit must be installed onto the machine. The machine is foot switch or push button actuated and designed to be bench mounted. This machine provides for medium volume production.

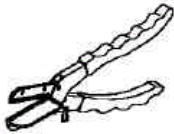
C. Semi-Automatic Machines

CHAMPOMATOR 2.5 bench terminating machine is pneumatically- and electrically-powered, microprocessor-controlled unit that produces double-ended cable assemblies using the insulation

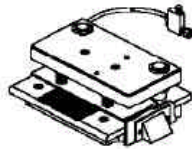
displacement technique. This machine is used for discrete wire or jacketed cable, and a tooling kit must be installed onto the machine. This machine is designed to be bench mounted and provides for medium volume production.

The Model "K" terminating machine provides the necessary force to drive an applicator for crimping the ferrule used with the shielding for receptacles. The applicator must be installed onto the machine. These machines are designed to be bench mounted and provide for high volume production.

Cable Preparation, Keying, and Extraction Tools



Ribbon Cable Cutting Hand Tool 91220-1 (408-6574)



Ribbon Cable Notcher 854449-[] (408-9515)

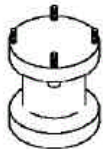


Keying Tool 843853-1 (408-9454)

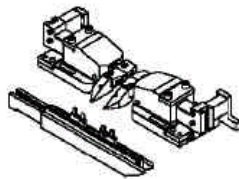


Extraction/Lance Reset Tool 843477-3 (408-9453)

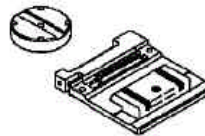
Head, Adapter, Die Assembly, Applicator, and Board Support



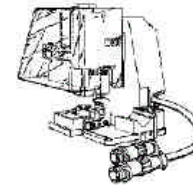
Adapter Kit 854468-[] (408-9687)



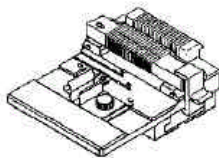
Tooling Kit 1-762661-0 (408-9678)



Pneumatic Upper Tool Mount 527145-1 and Discrete Wire Organizer Assembly 527085-1 (408-9138)



Ferrule Applicator Assembly 812407-1 (408-8083)



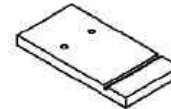
Tooling Assembly 91411-2 (408-9028)



Terminating Head 58062-1 (408-9085)



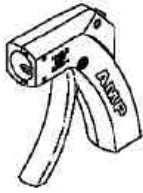
Die Assembly 812665-[] (No Document)
Die Assembly 527116-[] (No Document)



PC Board Support (Must Be Custom Made, Refer to 408-6927)

Figure 19 (Cont'd)

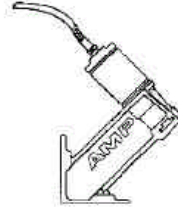
Hand Tools, Arbor Frame Assemblies, Machines, and Power Units



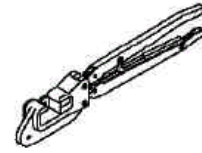
Pistol Grip Manual Handle
Assembly 58074-1
(408-6790)



Pistol Grip Pneumatic Handle
Assembly 58075-1
(408-6789)



Pneumatic Power Bench
Assembly 58338-1
(408-9393)

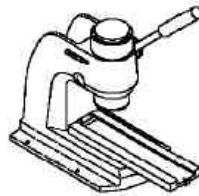


Hand Crimping Tool
91410-1 (408-6837)

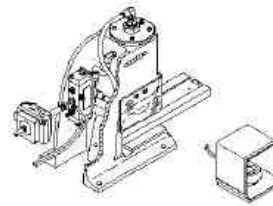
Note: Hand Tool Package 58577-1 consists of the pneumatic handle assembly and Terminating Head 58062-1.



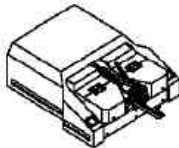
Manual Arbor Frame
Assembly 58024-1
(408-6923)



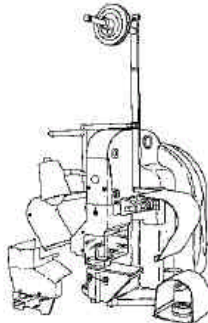
Manual Arbor Frame
Assembly 91085-2
(408-7777)



Pneumatic Applicator
Frame Assembly 91112-2
(408-7763)



CHAMPOMATOR 2.5 Bench
Terminating Machine
354786-[] (409-5839)



AMP-O-LECTRIC Model "K"
Terminating Machine 2-565435-2
(or 565435-5) (409-5128)



2700-lb Pneumatic Power
Unit 312522-1 (409-5843)



Electric Power Unit
931800-1 (409-5746)

Note: Machine 565435-5 is no longer available for new applications, but can still be used for existing applications.

Figure 19 (End)

6. VISUAL AID

The illustration below shows a typical application of AMPMODU MT Interconnection System. This illustration should be used by production personnel to ensure a correctly applied product. Applications which DO NOT appear correct should be inspected using the information in the preceding pages of this specification and in the instructional material shipped with the product or tooling.

RECEPTACLE

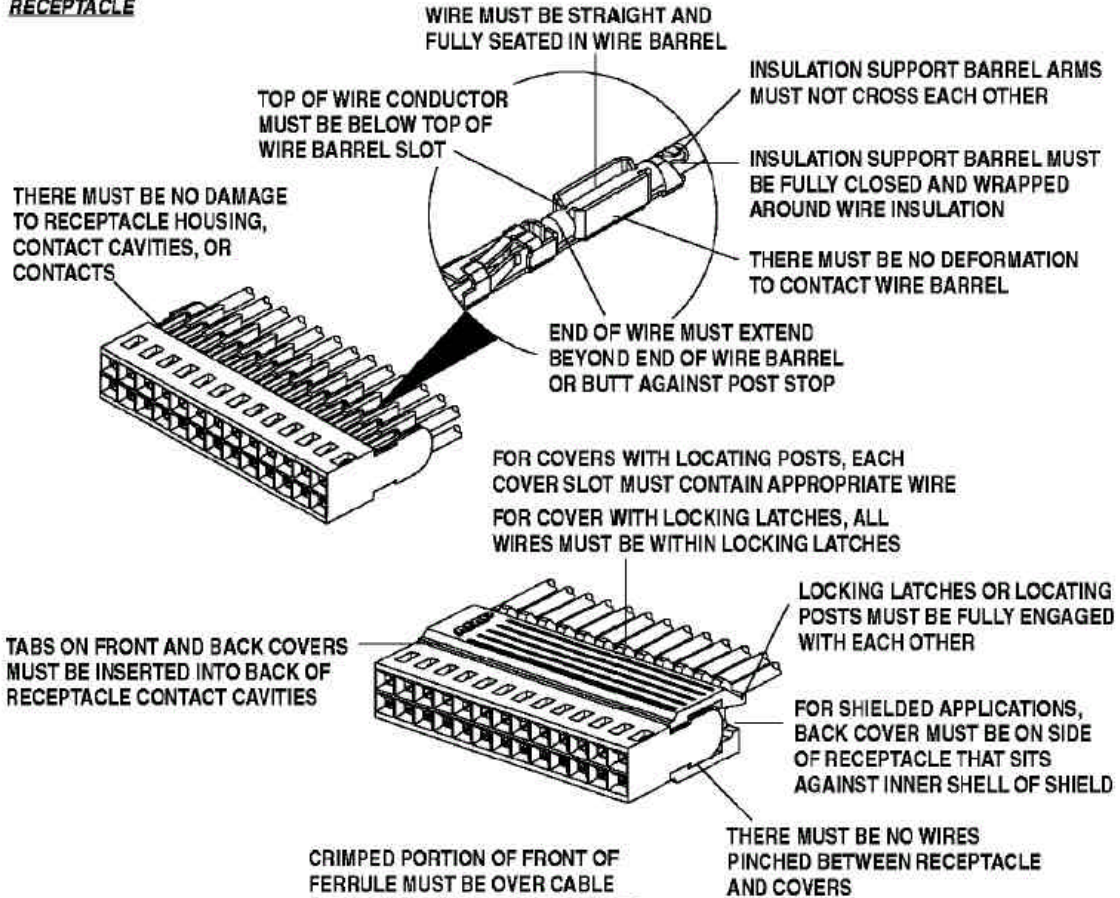


FIGURE 20. VISUAL AID (CONT'D)

MATED CONNECTORS

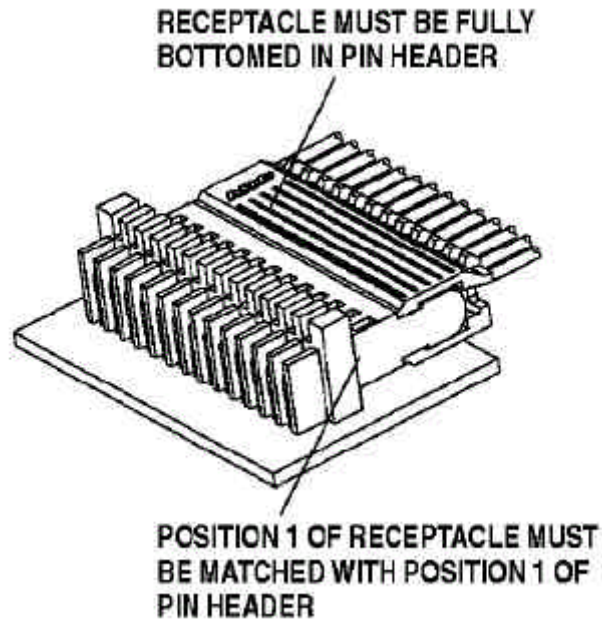


FIGURE 20. VISUAL AID (END)