



Space  
Technology  
Centre

University of Dundee

# SpaceWire

## ECSS-E-ST-50-12C

### Recommendation for Changes

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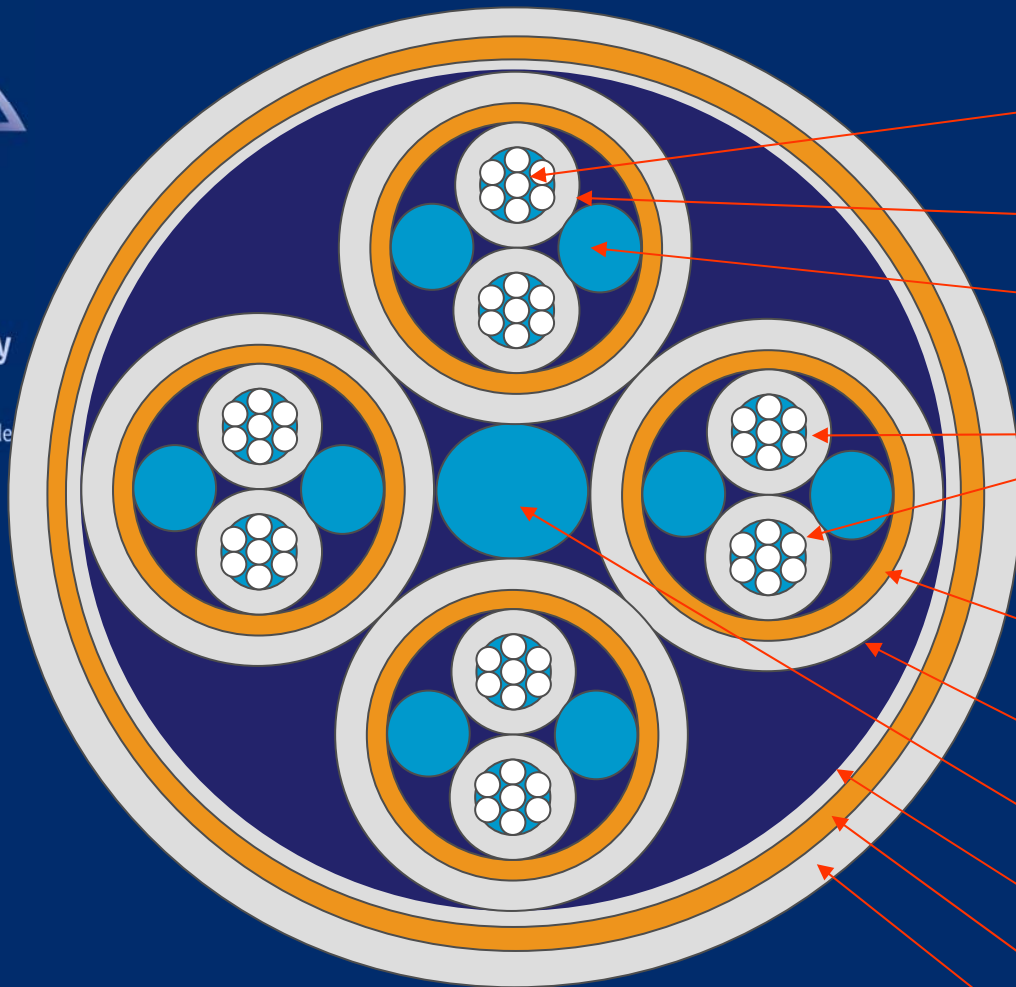
# General

- Separate informative and normative material

## 5.2/5.4 New Cable / Cable Assembly

- Inner shield not effective
  - Remove inner shields
    - May be a cross-talk issue
  - Connect inner shields together and to outer shield
    - Will reduce stiffness, size and weight
    - Will not degrade electrical performance
  - Include drain wire
    - Connect to pin 3 at both ends
    - Prevents “bulk-head” problem
    - Simplifies and improves grounding arrangement

# Cable Construction



Conductor 28 AWG  
(7 x 36 AWG)

Insulating layer

Filler

Twisted pair  
(100 ohm differential impedance)

Inner shield around  
twisted pair (40AWG)

Jacket

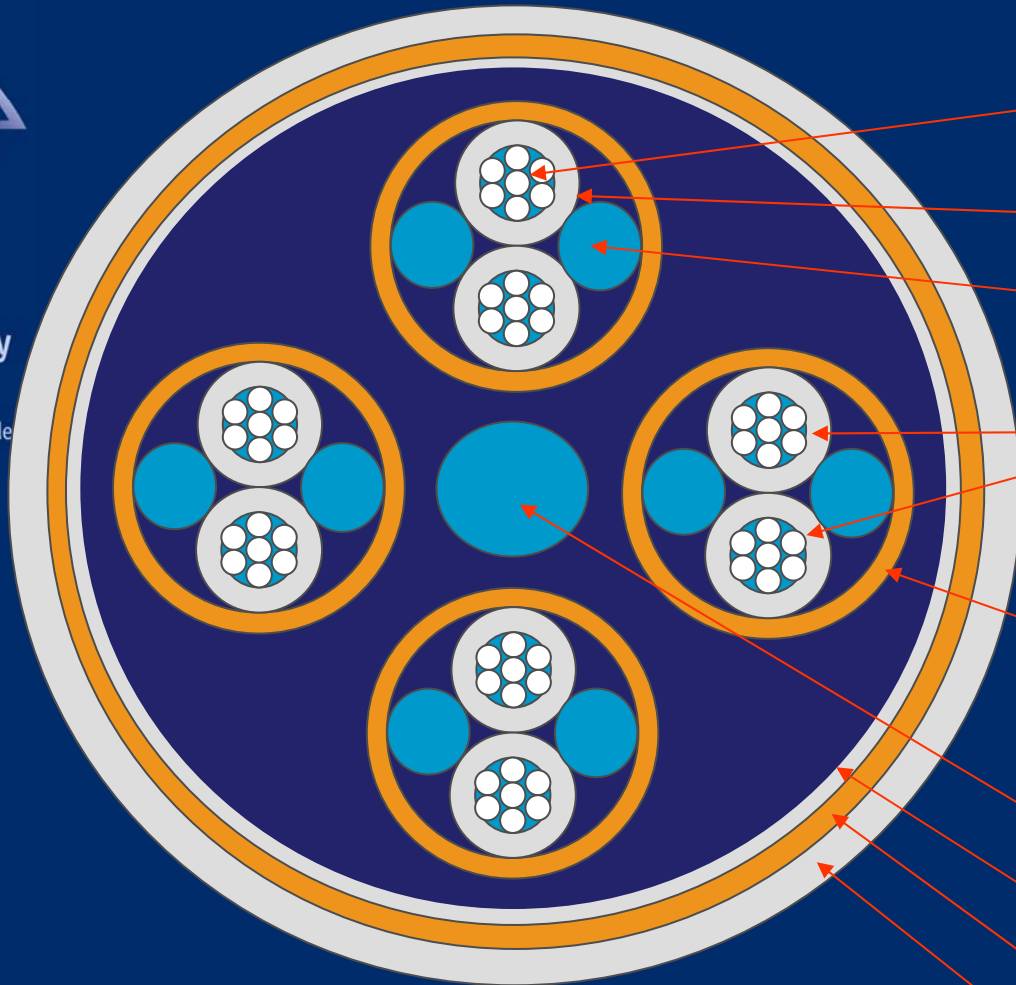
Filler

Binder

Outer shield (38AWG)

Outer Jacket

# Remove inner pair jacket



Conductor 28 AWG  
(7 x 36 AWG)

Insulating layer

Filler

Twisted pair  
(100 ohm differential impedance)

Inner shield around  
twisted pair (40AWG)

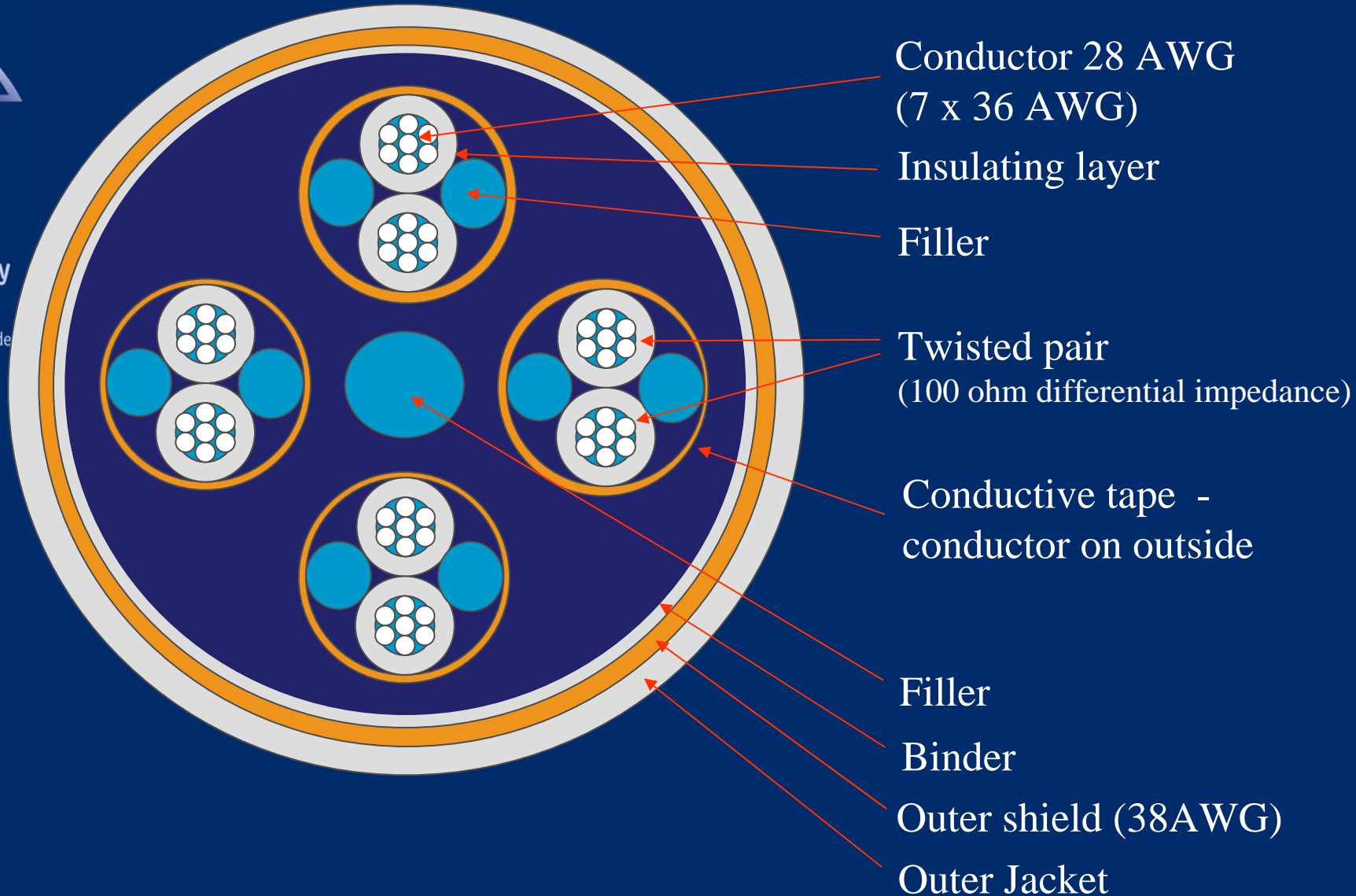
Filler

Binder

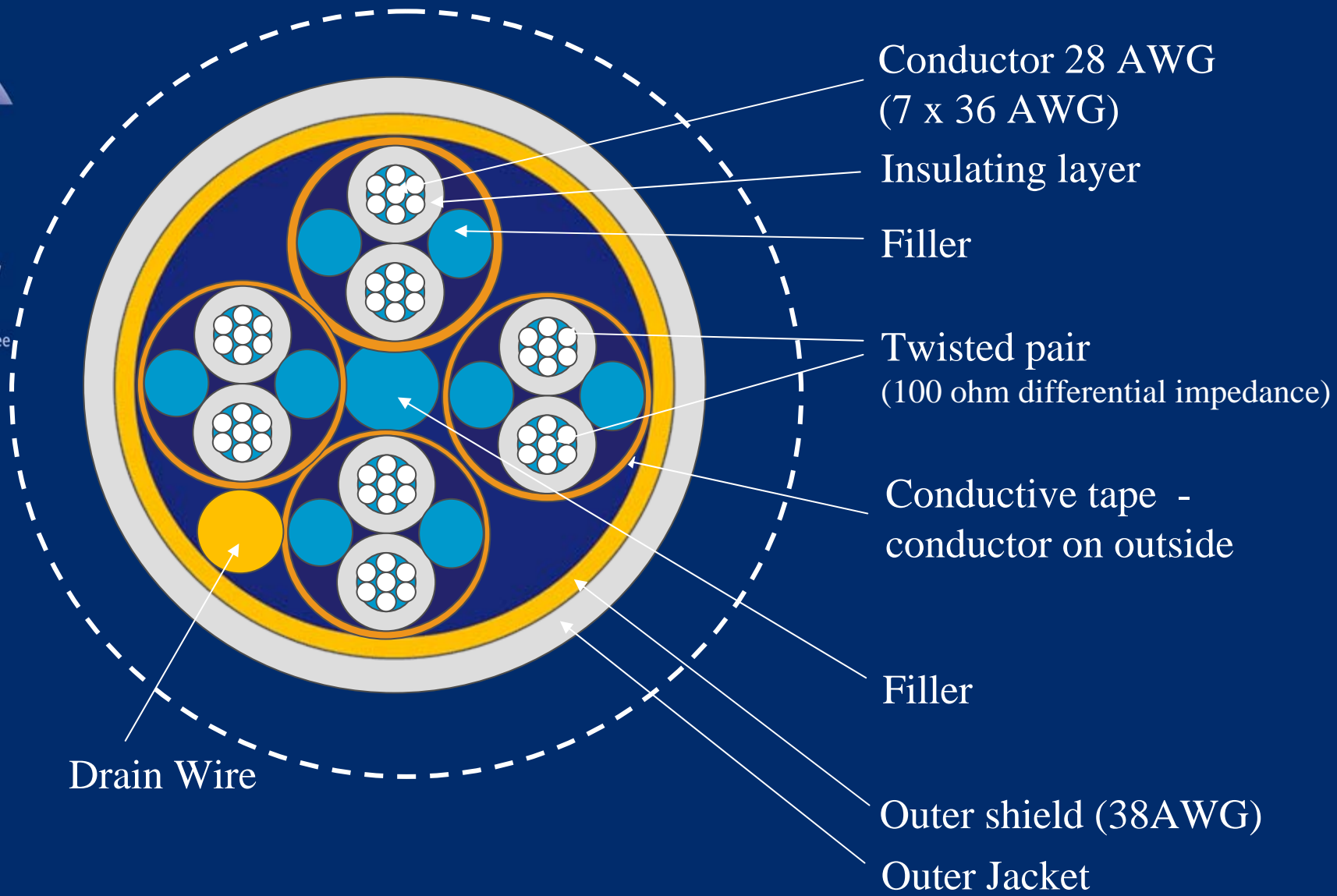
Outer shield (38AWG)

Outer Jacket

# Aluminiumised tape conductor on outside



# Proposed cable construction

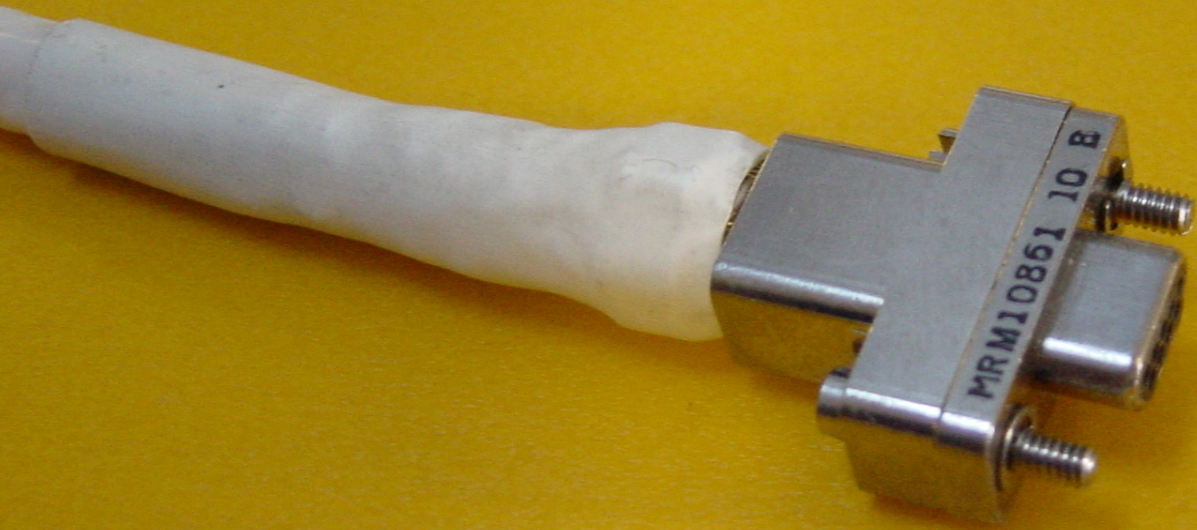


- Conductor 28 AWG (7 x 36 AWG)
- Insulating layer
- Filler
- Twisted pair (100 ohm differential impedance)
- Conductive tape - conductor on outside
- Filler
- Outer shield (38AWG)
- Outer Jacket

Drain Wire

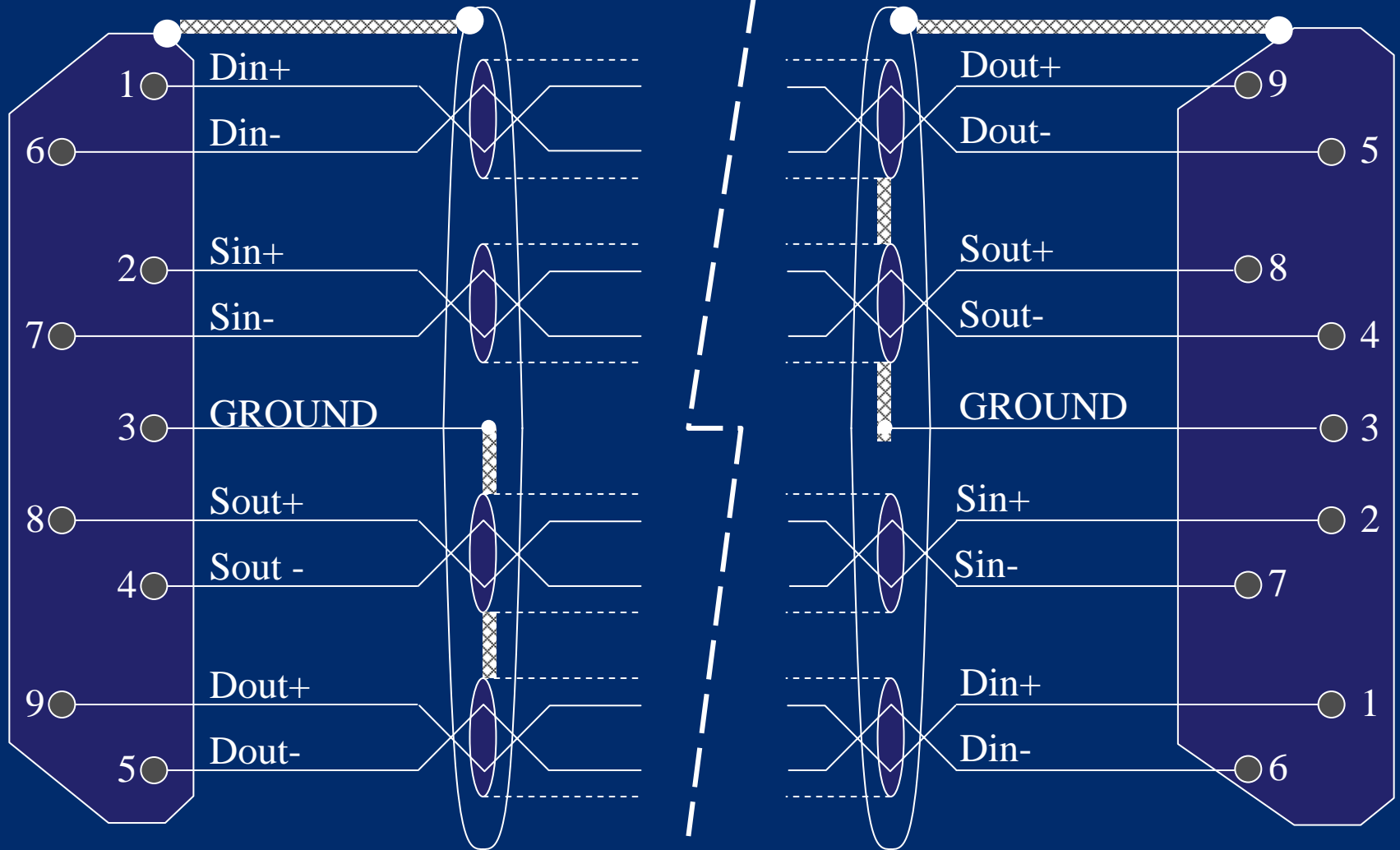
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# Cable Assembly





# Cable Assembly

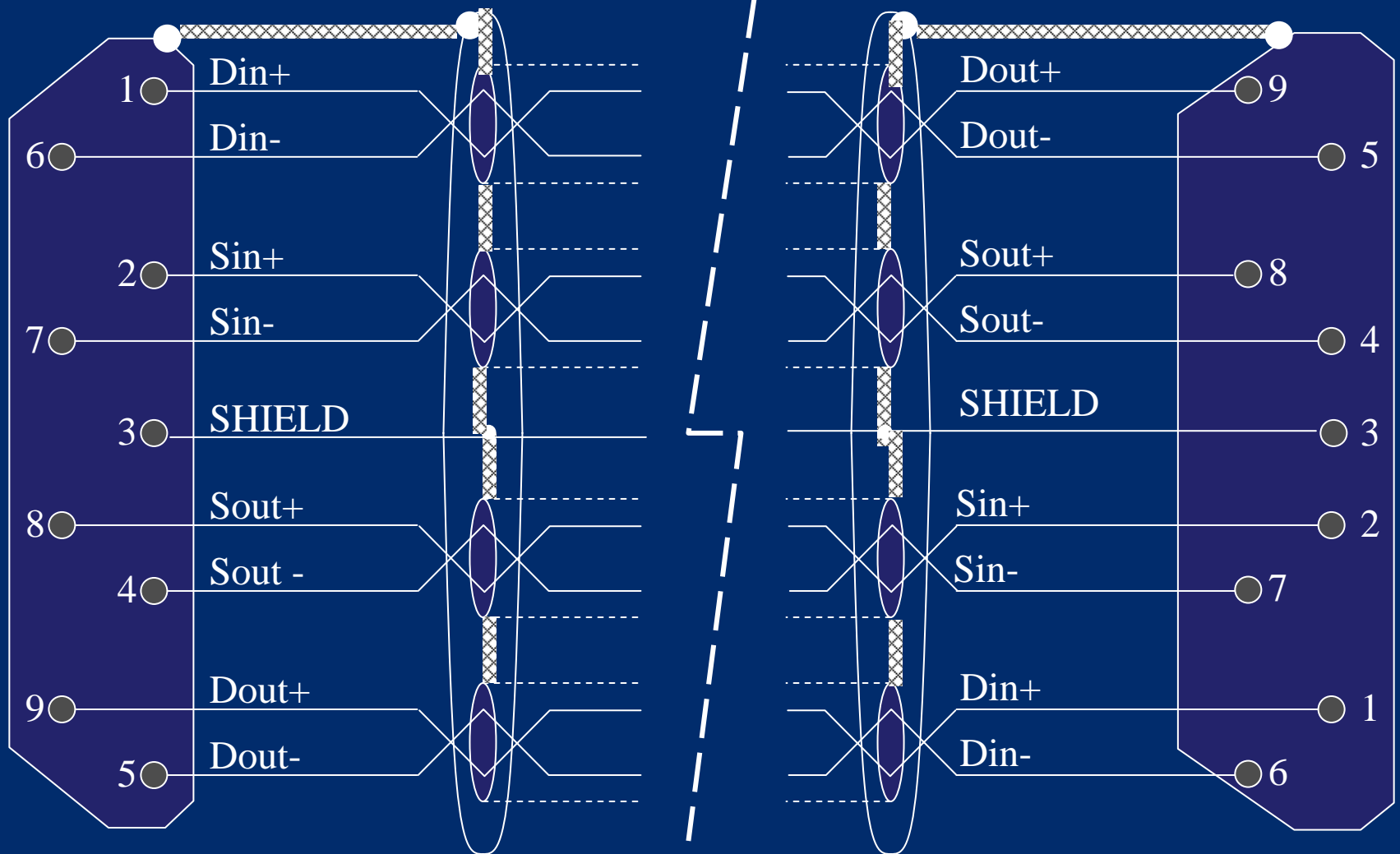




## Inner shields

- Connect to ground at one end only
- Provides a ground reference for differential pair
- 100 Mbit/s signals
- 1 ns edges
- 1 GHz signals
- Inner shield effective for around 150 mm

# Proposed Cable Assembly





## 5.2.4.15 Cable Signal Skew

- Make cable signal skew specification much tighter
- E.g. Factor of 5
  - 0.02 ns per m
  - 150 mm per ns
  - 3mm length difference per m of cable



# Cable attenuation

- Include larger wire gauge cores for reduced attenuation
- i.e. have a least two different cables
  - Larger, heavier long distance (20 m)
    - E.g. 26 AWG
  - Smaller, lighter short distance (5 m)
    - E.g. 28 AWG or 30 AWG?



# Higher Speed SpaceWire

- 400 Mbits/s plus
- Principal limitation is connector impedance mismatch
- (and cable attenuation)
- Need connector with 100 ohm differential impedance up to 2 or 3 Gbps

## 6.2 Input impedance

- Add clarification that the 100 k ohm input impedance is for the receiver chip only
- If does not include bias resistors used for prevention of noise induced switching when input is open circuit.
- Recommended practice with LVDS



## 6.6.1 Minimum Data rate

- Increase minimum data rate to 4 Mbits/s
- Allows time for both ends to respond to speed change
- Possible extension to low data rate start-up
  - E.g. 1 Mbits/s or 2 Mbit/s
  - Required modification to state machine time-out times



## 6.6.2 Maximum data rate

- Define maximum data rate to be 200 Mbits/s using existing specified cables and connectors



## 6.6.4 Skew

- Define skew and jitter in terms of acceptable eye pattern at receiver

## 7.3 Time Codes

- Remove (c) note 2 and part of (d)
- SpW-WG reserved time-codes
- NASA use multiple time-codes
- Both violate the existing standard

## 8.12.2(m) Link disconnect and time-code

- Delete “... or disconnect-reconnect (state-machine in error reset state)”
- This is incorrect and stops time-codes working briefly after a link disconnect

## 10.6.4.3 Node invalid address

- Packet with unexpected destination address shall be discarded
- Conflict with RMAP which responds to invalid addresses
- Change to can discard packets with invalid address



## 10.2.8 Virtual Channels

- Remove all text related to virtual channels



## 10.3 Router Time-Outs

- Add router time-out requirements