Specifications of twisted pair cables for D0 Run 2B silicon upgrade

Last revision: A.Nomerotski 2/21/02

Figure 2. Description of Twisted Pair Cable

The Twisted Pair Cable, approximately 2.5 meters long, connects the Junction Cards (JC) and Adapter Cards (AC) as shown in Figure 1.

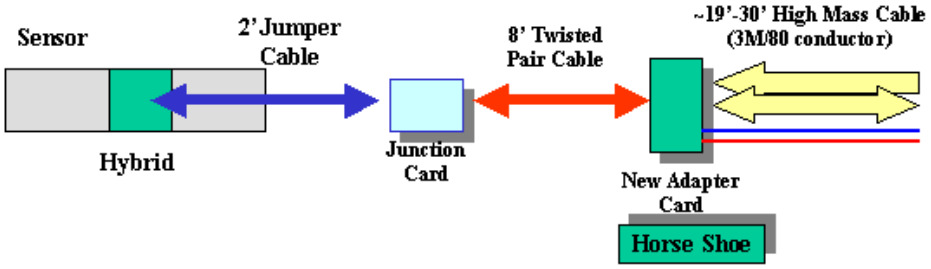

Figure 1. Conceptual readout for D0 Run 2B silicon

The twisted pairs were chosen because 10 of the SVX4 signals are differential (D0-D7, DVALID, Priority_Out). The 6 slower single ended lines (VCAL, CAL_SR, Mode_1, Mode_2, Change_Mode, Priority _In) will also use twisted pairs. The temperature sensor on the hybrid will require one twisted pair, and sensing of hybrid voltages will require three twisted pairs. The cable assembly will have 2 power lines (AVDD and DVDD) and their returns, 1 HV line and its return. Clock signals are transmitted via two coaxial cables.

The cable is soldered to the Junction Card on one side and is terminated by connectors on the Adapter Card side as show in Figure 2. The total outer diameter of a Twisted Pair bundle can be as small as 5-6 mm.

There will be two types of the Junction Card : 3-channel JC for Layers 0-1 and 2-channel JC for Layers 2-5. Total number of channels in L0-1 is 216 corresponding to 72 3-ch JC. Total number of channels in L2-5 is 672 corresponding to 336 2-ch JC.

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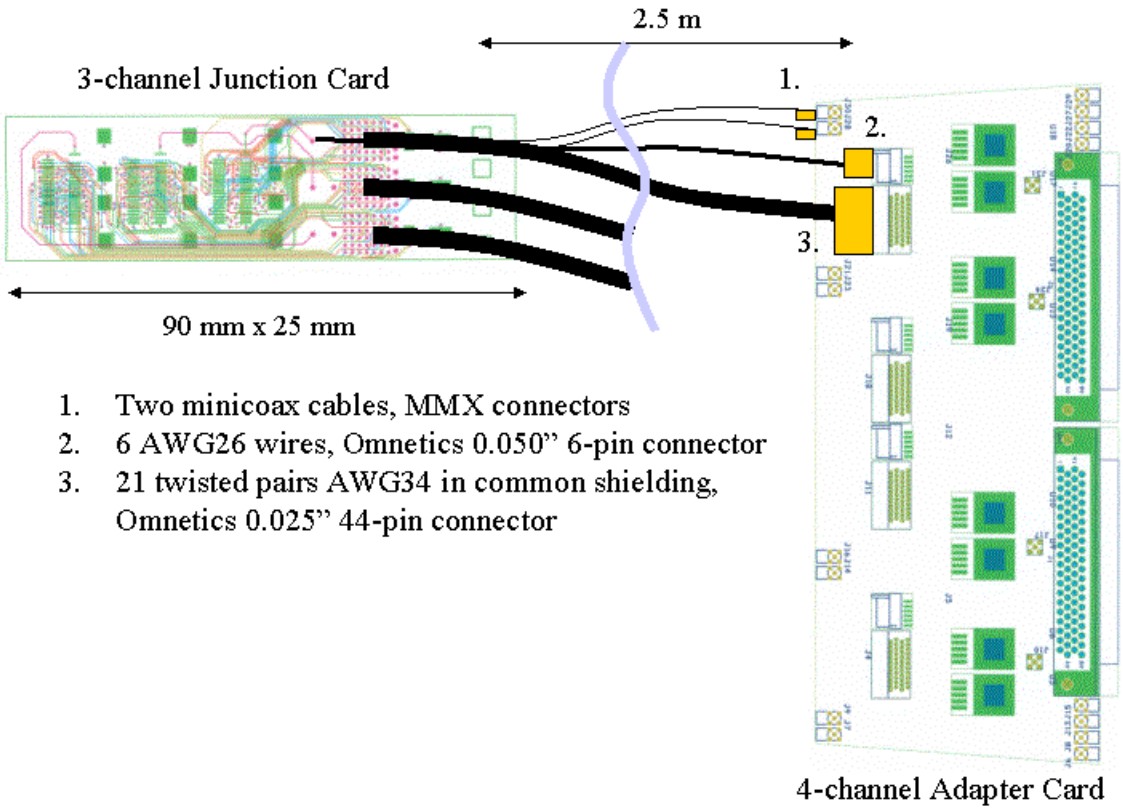

Figure 2. Twisted Pair Cable bundle

2. Specifications of cables

1. Clock cables
    a. Subminiature coax cable, New England Electric Wire
    b. Length 2.5 m (to be determined)
    c. Termination
        i. AC side: MMX connectors (terminated at KSM for Run 2A)
        ii. JC side: soldered to JC according to diagram
2. Power and HV lines
    a. Three twisted pairs,
        i. AWG26 stranded wire
        ii. Flame retardant, halogen free insulator

    b. Length 2.5 m (to be determined)
    c. HV lines are specified up to 1000 V
    d. Termination
        i. AC side: 7-pin connector Omnetics 0.05" spacing with polarity terminated with AWG26 wires (standard termination option)
        ii. HV pin is the edge pin with the next pin removed to increase the separation from the other pins
        iii. JC side: soldered to JC according to diagram
3. Signal lines
    a. 21 twisted pairs
        i. AWG34 stranded wire (New England Electrical Wire)
        ii. Flame retardant, halogen free insulator
    b. Common shielding
    c. Length 2.5 m (to be determined)
    d. Termination
        i. AC side: 44-pin Omnetics connector 0.025" spacing with polarity terminated with the above AWG34 pairs (standard termination option). The common shielding is terminated to two edge pins of the connector (standard termination option).
        ii. JC side: soldered to JC according to diagram
4. All above is assembled in a bundle with common shielding starting from JC and finishing ~10 cm before AC
    a. The bundle is restrained on the JC side
    b. Bundle common shielding is connected to JC GND on JC side
5. One type of JC will have 3 bundles as described above. There will be another JC type with 2 bundles.

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3. Assembly

Different parts of the twisted pair cable will be purchased from different vendors:

- Submini coax cables; have enough for prototyping
- MMX connectors, termination; KSM
- Omnetics 7-pin connector terminated with AWG26 twisted pairs; will be ordered from Omnetics
- AWG34 twisted pairs: New England ElectricWire; sample ordered
- Omnetics 44-pin connector terminated with the above pairs and common shielding; will be ordered from Omnetics
- Overall shielding; available?
- Junction Card; will be supplied by KSU

The parts above will be assembled together with Junction Card at another vendor (yet to be defined). The assembly of one readout channel will include:

- Soldering of two submini coax cables
- Soldering of six AWG26 wires

- Soldering of 42 AWG34 wires (21 twisted pairs)
- Soldering of common shielding of 21 twisted pair bundle
- Soldering of the overall shielding
- Restraining the bundle to Junction Card

The soldering diagram is shown schematically in Figure 3.

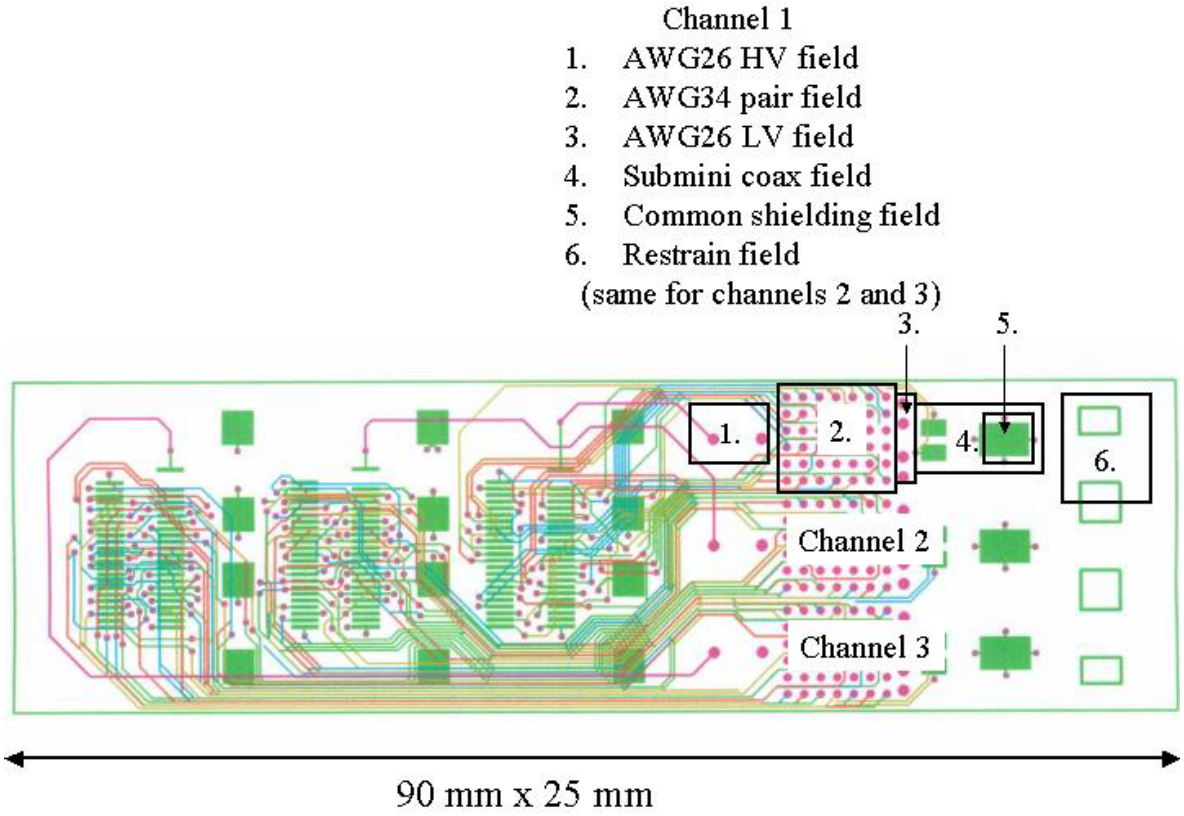

Figure 3. Junction Card with soldering diagram.

One Junction Card will have three readout channels. Later we foresee another type of Junction Card with two channels.

4. Tests at vendor

1. Visual inspection
2. Testing for shorts and continuity

5. References

1. Soldering diagrams
2. Junction Card specifications
3. Adapter Card specifications