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भारतीय ताराभौतिकी संस्थान  
INDIAN INSTITUTE OF ASTROPHYSICS  
कोरमंगला / KORAMANGALA  
बेंगलूर / BANGALORE - 560 034.

**Deadline extended to March 14, 2008, 15.30hrs.**

No: PUR/IMP/AK/UVIT-ISRO/73/07-08

February 14, 2008

M/s.

Dear Sirs,

The Director, Indian Institute of Astrophysics, Bangalore invites Sealed Tenders for the Import of “ Cable Harness Assembly to be used in Space with 78-pin & 50 - pin High Density D-sub connectors as per our specification/details” detailed in the Tender Form hereto annexed. The terms and conditions are also enclosed may be noted and if you are in a position to quote for the supply in accordance with the requirement, please submit your quotation in the attached Tender Form. **The specification/details attached separately.** The Tender documents are available on IIA web site [www.iiap.res.in/tenders.htm](http://www.iiap.res.in/tenders.htm)

**The Tender bids should be in foreign currency only.** Your completed Tender bids must reach this office in sealed envelope duly superscribed with the name of the supply on or before 15.30 Hrs. latest by **14.03.2008.**

Thanking you,

Yours faithfully,

Encl.: as above.

Administrative Officer  
For Director



**PUBLIC TENDER DOCUMENT NO: PUR/IMP/AK/UVIT-ISRO/73/07-08.**  
**DT: 14.02.2008**

**TENDER FORM**

FROM:

TO

THE DIRECTOR,  
Indian Institute of Astrophysics.,  
Bangalore-560 034.

Sir,

I/We hereby offer to supply the Items/Equipment indicated below at the price hereunder quoted and agree to hold this office open till \_\_\_\_\_. I/We shall be bound to supply the Items/Equipment hereby offered upon the issue of the Purchase Order communicating to the acceptance thereof on or before the expiry of the last mentioned date. You are at liberty to accept any one or more of the items of such Items/Equipment. I/We notwithstanding that the offer in this tender has not been accepted in whole, shall be bound to supply such items and such portion or portions of one or more of the items as may be specified in the said Purchase Order communicating the acceptance.

| Sl.No. | Description of the item(s)   | Qty. | Unit | Rate | Dely. Period |
|--------|--|------|------|------|--------------|
| 1.     | Cable Harness Assembly to be used in Space with 78-pin High Density D-sub connectors (as per the attached details) | 4    | Nos  |      |              |
| 2.     | Cable Harness Assembly to be used in space with 50-pin D-sub connectors (as per the attached Details)              | 4    | Nos  |      |              |

**(Tender bids should be in Foreign currency only)**



Place at which the Delivery is required : Indian Institute of Astrophysics  
Bangalore-560034

Date by which the supplies are required : 4 weeks from the date of order

2. I/We have understood the items of the tender annexed to the invitation to the Tender and have thoroughly examined the specifications/drawing and /or pattern quoted or referred to herein and/are fully aware of the nature of the items/Equipment required and my/our offer is to supply the items/Equipment strictly in accordance with the requirements subject to the terms and conditions contained in the Purchase Order communicating the acceptance of this tender either in whole or in part.

Date:

Signature and Seal of Supplier



## Annexure - I

### INSTRUCTIONS TO SUPPLIERS

1. Tenders should be sent in sealed and superscribed envelopes with mention of Tender No. date and date of opening. Only one Tender should be sent in each envelope.
2. Late and Delayed Tender will not considered at all.
3. Duties, Taxes where legally leviable and intended to be claimed should be distinctly shown separately in the Tender.
4. a) Your quotation should be valid for 90-120 days from the date. of opening of Tender  
  
b) Prices are required to be quoted accordingly to the units indicated in the annexed tender form. When quotations are given in terms of units other than those specified in the tender form, relationship between the two sets of units must be furnished.
5. Preference will be given to those tenders offering supplies from ready stocks and on the basis of delivery at Site.
6. a) All available Technical Literature(s), Catalogue(s) and other data in support of the specifications and details of the item(s) should be furnished along with the offer.  
  
b) Approximate net and gross weight of the items offered shall be indicated in your offer. If dimensional details are available the same should indicated in your offer.  
  
c) Air freight/sea freight charges up to Bangalore Airport may be sent along with the offer.



**d) SPECIFICATIONS:**

Items/Equipment offered should strictly conform to our specifications. Deviation, if any should be clearly indicated by the Supplier in their quotation. The Supplier should also indicate the Make/type No. of the stores offered and provide catalogue(s), Technical literature(s) and sample(s), wherever necessary along with the quotations. Test certificates wherever necessary should be forwarded along with the supplies. Whenever options are called for in our specifications, the Supplier should address all such options. Wherever specifically mentioned by us the Supplier could suggest changes to specifications with appropriate response for the same.

1. Corrections, if any, must be attested. All amounts shall be indicated both in words as well as in figures. Where there is difference between amounts quoted in words and figures, amount quoted in words shall prevail.
2. The Supplier should supply along with the tender, the Banking information for payment or any other purpose
3. A complete set of instruction and operation manual should be supplied at the time of installation.
4. Final performance should be guaranteed at the site.



## **TERMS AND CONDITIONS OF CONTRACT**

### **1. DEFINITIONS:**

- a). The terms 'Purchaser' shall mean the Director, Indian Institute of Astrophysics, Bangalore-560 034.
- b). The term 'Supplier' shall mean, the person, firm or company with whom or with which the order for the supply of Items/Equipment is placed.
- c). The terms 'Purchase Order' shall mean the communication signed on behalf of the Purchaser by an officer duly authorized intimating the acceptance on behalf the Purchaser on the terms and conditions mentioned or referred to in the said communications accepting the tender or offer of the supplier for supply of Items/Equipment.

### **2. PRICES:**

The price may please be indicated on unit basis only.

#### **Duty Exemption:**

Please note that we may issue "Customs duty Exemption Certificate", if acceptable under the Govt. of India notification No. 51/96 valid till 2011.

### **3. GUARANTEE AND REPLACEMENT:**

- a) The Supplier shall guarantee that the Items/Equipment supplied shall comply fully with the specifications laid down, for material workmanship and performance. The Guarantee should be for a period of one year minimum from the date of supply.



4. **PACKING, FORWARDING AND INSURANCE:**

The Contractor will be held responsible for the stores being sufficiently and properly packed for transport by sea or air, to withstand transit hazards and ensure safe arrival at the destination. The packing and marking of packing shall be done by and at the expenses of the contractor. The Purchaser will not pay separately for transit insurance, all risks in transit being exclusively of the Supplier and the Purchaser shall pay only for such Items/Equipment as are actually received in good condition, in accordance with contract.

5. **TEST CERTIFICATE:**

Wherever required Test Certificate should be sent along with the relevant dispatch documents

6. **ACCEPTANCE OF ITEMS/EQUIPMENT:**

a) The Items/Equipment shall be tendered by the supplier for inspection at such places as may be specified by the purchaser at the suppliers own risk, expenses and cost.

b) It is expressly agreed that the acceptance of Items/Equipment, for is subject to final approval by the Purchaser, whose decision shall be final.

7. **DELIVERY PERIOD:**

Delivery is the essence of the contract. The supplier should adhered to delivery schedule as indicated in the Purchase order.

8. **EXTENTION OF DELIVERY TIME:**

As soon as it is apparent that Supplier dates cannot be adhered to, an application shall be sent by the Supplier to the Purchaser. If failure, on the part of the Supplier to deliver the Items/Equipment in proper time shall have arisen from any cause which the Purchaser may admit as reasonable ground for an extension of the time (and his decision shall be final he may allow such additional time as he considers it to be justified by the circumstances of the case) . In case of Letter of Credit the banking charges for the LOC amendment will be on suppliers account.



**9. PAYMENT:**

Preference will be given to the supplier whose payment terms is on Site Draft.

**10. SECURITY FOR PAYMENT:**

Successful Supplier will have to furnish in the form of a Bank Guarantee or any other form as called for by the Purchaser towards any payments before supply of Items/Equipment. In case of payment through Letter of Credit the banking charges out side India and Inside India will be on suppliers account.



### **Items to be Supplied for Flight of UVIT Payload**

Item 1: Cable Harness Assembly to be used in Space with 78-pin High Density D-Sub Connectors.

Item 2: Cable Harness Assembly to be used in Space with 50-pin D-Sub Connectors

**End Use of Items:** The above listed items (cable assemblies) will be used on ULTRA VIOLET IMAGING TELESCOPE on ASTROSAT (first Multiwavelength Satellite of India). These harnesses will be routing from the detector and High Voltage Unit to Electronic Processing Unit respectively. These harnesses will be carrying the video signals and other controlling signals.

The Specifications and Details of the above are mentioned below:

#### **General Specification for the Item 1 & 2**

1. The manufacturer must give the drawings and bill of materials to be used for cables assemblies and get approved before fabrication of the cable harness assemblies.
2. Monthly Progress Report.
3. Delivery Schedule to be given.
4. Cable Assemblies must under go the following test and the manufacturer has to supply the test report.
  - a. Continuity Test and Cross Continuity Test
  - b. Isolation Test.
  - c. High Voltage Test.
5. Drawings and Bill of materials of cable assemblies as built.
6. Mass of the cable assemblies as built.
7. Certificate of Conformance to as-built configuration.
8. Non-conformance Reports based on concessions agreed during the process of manufacturing.

#### **Specifications:**

##### **Item -1 Cable Harness Assembly with 78-pin HD D-Sub Connectors**

This cable assembly will be used in the Ultra Violet Imaging Telescope on ASTROSAT (first Multiwavelength Satellite of India). This cable harness will be routing from the Detector to Electronic Processing Unit.

Specifications for the items to be used in this 78-pin assembly (4 Nos) for item no.1 are:

1. Length of the cable harness (end to end): 3.2 mtrs.
2. Bending Radius: < 120 mm
3. Wires:
  - a. Coaxial Cables: 2 Nos. (Belden Make, MIL-C-17G, M17/ 111 RG-303, 50 Ohm, Part No. 84303)
  - b. Single: 3 Nos. (MIL-W-22759/11)
  - c. TSP: 27 Nos. (Characteristics Impedance of 77 Ohms should be maintained throughout length, Belden Make, MIL-C-17G QPL Cable, Twinax Part No. 81553)
4. The cable would be enveloped with the Braided Sleeve (Braided Sleeving 1 ½, FR Braid) (Space Qualified with Low CVCM & TML, Supply the values of CVCM & TML)
5. EMI Braid (ALHA Part No. 2179)
6. Braid (ALPHA Part No. 2162)

7. Braided Sleeving 1/8 (to be used over Braid (Alpha 2162)) (Space Qualified with Low CVCM & TML, Supply the values of CVCM & TML).
8. Connectors and Backshells:
  - a. Connector at one end: HD D-Sub 78-pin Male (GSFC Part No. 311P407-5P-B12 of Positronic or ITT cannon or AMP make) with Backshell (Glenair Part no. 557T246M516)
  - b. Connector at other end: HD D-Sub 78-pin Female (GSFC Part No. 311P407-5S-B12 of Positronic or ITT cannon or AMP make) with Backshell (Glenair Part no. 557T196M5R2H0-12B)
9. Workmanship in accordance with NASA-STD-8739.4, Crimping, Interconnecting, Cables, Harness and wiring.
10. Attach Temporary label to each connector. So that it can be remove before flight.
11. Pins 59, 61, 62, 74, 75 are Guards: not connected.
12. Heat Shrink Tubing – Low Outgassing Material (Space Qualified with Low CVCM & TML, Supply the values of CVCM & TML)

**Table 1: Pin Description of HD D-Sub 78-pin (4 Nos only) Cable Harness Assembly**

| SL NO. | Functional Description                                 | Wire      | Gauge | Specifications      |
|--------|--|-----------|-------|---------------------|
| 01     | Cable Shield   | EMI Braid |       | APLHA 2179          |
| 02     | Star250 Reset Bias                                     | TPS-1a    | 24    | BELDEN 81553 (77 Ω) |
| 03     | Video+   | Coaxial   | 18    | BELDEN 84303 (50 Ω) |
| 04     | Spare with 23  | TPS-2a    | 24    | BELDEN 81553 (77 Ω) |
| 05     | Spare with 24  | TPS-3a    | 24    | BELDEN 81553 (77 Ω) |
| 06     | LVDS 19+   | TPS-4a    | 24    | BELDEN 81553 (77 Ω) |
| 07     | LVDS 17+   | TPS-5a    | 24    | BELDEN 81553 (77 Ω) |
| 08     | LVDS 15+   | TPS-6a    | 24    | BELDEN 81553 (77 Ω) |
| 09     | LVDS 13+   | TPS-7a    | 24    | BELDEN 81553 (77 Ω) |
| 10     | LVDS 11+   | TPS-8a    | 24    | BELDEN 81553 (77 Ω) |
| 11     | Shield for (12 31), (13 32), (14 33), (15 34), (16 35) |           |       |                     |
| 12     | LVDS 9+  | TPS-9a    | 24    | BELDEN 81553 (77 Ω) |
| 13     | LVDS 7+  | TPS-10a   | 24    | BELDEN 81553 (77 Ω) |
| 14     | LVDS 5+  | TPS-11a   | 24    | BELDEN 81553 (77 Ω) |
| 15     | LVDS 3+  | TPS-12a   | 24    | BELDEN 81553 (77 Ω) |
| 16     | LVDS 1+  | TPS-13a   | 24    | BELDEN 81553 (77 Ω) |
| 17     | Spare with 36  | TPS-14a   | 24    | BELDEN 81553 (77 Ω) |
| 18     | CPU SEL  | TPS-15a   | 24    | BELDEN 81553 (77 Ω) |
| 19     | Thermistor CPU+  | TPS-16a   | 24    | BELDEN 81553 (77 Ω) |
| 20     | Cable Shield   | EMI Braid |       | APLHA 2179          |
| 21     | Reset Bias Return                                      | TPS-1b    | 24    |                     |
| 22     | Video+ shield (3)                                      |           |       |                     |
| 23     | Spare with 4   | TPS-2b    | 24    |                     |
| 24     | Spare with 5   | TPS-3b    | 24    |                     |
| 25     | LVDS 19-   | TPS-4b    | 24    |                     |
| 26     | LVDS 17-   | TPS-5b    | 24    |                     |
| 27     | LVDS 15-   | TPS-6b    | 24    |                     |
| 28     | LVDS 13-   | TPS-7b    | 24    |                     |
| 29     | LVDS 11-   | TPS-8b    | 24    |                     |
| 30     | Shield for (6 25), (7 26), (8 27), (9 28), (10 29)     |           |       |                     |
| 31     | LVDS 9-  | TPS-9b    | 24    |                     |
| 32     | LVDS 7-  | TPS-10b   | 24    |                     |

|               |  |             |              |                             |
|---------------|--|-------------|--------------|-----------------------------|
| 33            | LVDS 5-  | TPS-11b     | 24           |                             |
| <b>SL NO.</b> | <b>Functional Description</b>                                | <b>Wire</b> | <b>Gauge</b> | <b>Specifications</b>       |
| 34            | LVDS 3-  | TPS-12b     | 24           |                             |
| 35            | LVDS 1-  | TPS-13b     | 24           |                             |
| 36            | Spare with 17  | TPS-14b     | 24           |                             |
| 37            | Return CPU SEL   | TPS-15b     | 24           |                             |
| 38            | Thermistor CPU-  | TPS-16b     | 24           |                             |
| 39            | +12V   | Single      | 24           | MIL-W-22759/11              |
| 40            | Shield for (2 21)  |             |              |                             |
| 41            | Video-   | Coaxial     | 18           | BELDEN 84303 (50 $\Omega$ ) |
| 42            | Shield for (4 23)  |             |              |                             |
| 43            | Shield for (5 24)  |             |              |                             |
| 44            | LVDS 20+   | TPS-17a     | 24           | BELDEN 81553 (77 $\Omega$ ) |
| 45            | LVDS 18+   | TPS-18a     | 24           | BELDEN 81553 (77 $\Omega$ ) |
| 46            | LVDS 16+   | TPS-19a     | 24           | BELDEN 81553 (77 $\Omega$ ) |
| 47            | LVDS 14+   | TPS-20a     | 24           | BELDEN 81553 (77 $\Omega$ ) |
| 48            | LVDS 12+   | TPS-21a     | 24           | BELDEN 81553 (77 $\Omega$ ) |
| 49            | Shield for (50 69), (51 70),<br>(52 71),<br>(53 72), (54 73) |             |              |                             |
| 50            | LVDS 10+   | TPS-22a     | 24           | BELDEN 81553 (77 $\Omega$ ) |
| 51            | LVDS 8+  | TPS-23a     | 24           | BELDEN 81553 (77 $\Omega$ ) |
| 52            | LVDS 6+  | TPS-24a     | 24           | BELDEN 81553 (77 $\Omega$ ) |
| 53            | LVDS 4+  | TPS-25a     | 24           | BELDEN 81553 (77 $\Omega$ ) |
| 54            | LVDS 2+  | TPS-26a     | 24           | BELDEN 81553 (77 $\Omega$ ) |
| 55            | Shield for (17 36)   |             |              |                             |
| 56            | Shield for (18 37), (19 38),<br>(57 76)                      |             |              |                             |
| 57            | Thermistor Star250+  | TPS-27a     | 24           | BELDEN 81553 (77 $\Omega$ ) |
| 58            | -12V   | Single      | 24           | MIL-W-22759/11              |
| 59            | Guard  | NC          |              |                             |
| 60            | Video- Shield (41)   |             |              |                             |
| 61            | Guard  | NC          |              |                             |
| 62            | Guard  | NC          |              |                             |
| 63            | LVDS 20-   | TPS-17b     | 24           |                             |
| 64            | LVDS 18-   | TPS-18b     | 24           |                             |
| 65            | LVDS 16-   | TPS-19b     | 24           |                             |
| 66            | LVDS 14-   | TPS-20b     | 24           |                             |
| 67            | LVDS 12-   | TPS-21b     | 24           |                             |
| 68            | Shield for (44 63), (45 64),<br>(46 65), (47 66), (48 67)    |             |              |                             |
| 69            | LVDS 10-   | TPS-22b     | 24           |                             |
| 70            | LVDS 8-  | TPS-23b     | 24           |                             |
| 71            | LVDS 6-  | TPS-24b     | 24           |                             |
| 72            | LVDS 4-  | TPS-25b     | 24           |                             |
| 73            | LVDS 2-  | TPS-26b     | 24           |                             |
| 74            | Guard  |             |              |                             |
| 75            | Guard  |             |              |                             |
| 76            | Thermistor Star250-  | TPS-27b     | 24           |                             |
| 77            | Return +/-12V  | Single      | 24           | MIL-W-22759/11              |
| 78            | Shield (39 58 77)  | Braid       |              | APLHA 2162                  |

**Item -2 Cable Harness Assembly with 50-pin D-Sub Connectors**

This cable assembly will be used in the Ultra Violet Imaging Telescope on ASTROSAT (first Multiwavelength Satellite of India). This cable harness will be routing from the High Voltage Unit to Electronic Processing Unit.

Specifications for the items to be used in this 50-pin assembly (4 Nos) for item no.2 are:

1. Length of the cable harness (end to end): 3.2 mtrs.
2. Bending Radius: < 90 mm
3. Wires:
  - a. Single: 5 Nos. (MIL-W-22759/11)
  - b. TSP: 12 Nos. (Characteristics Impedance of 77 Ohms should be maintained throughout length, Belden Make, MIL-C-17G QPL Cable, Twinax Part No. 81553)
4. The cable would be enveloped with the Braided Sleeve (Braided Sleeving 1 ½, FR Braid) (Space Qualified with Low CVCM & TML, Supply the values of CVCM & TML).
5. EMI Braid (ALPHA Part No. 2179)
6. Braid (ALPHA Part No. 2162)
7. Braided Sleeving 1/8 (to be used over Braid (Alpha 2162)) (Space Qualified with Low CVCM & TML, Supply the values of CVCM & TML)
8. Connectors and Backshells:
  - a. Connector at one end: D-Sub 50-pin Male (GSFC Part No. 311P409-5P-B12 of Positronic or ITT cannon or AMP make) with Backshell (Glenair Part no. 557T246M511)
  - b. Connector at other end: D Sub 50-pin Female (GSFC Part No. 311P409-5S-B12 of Positronic or ITT cannon or AMP make) with Backshell (Glenair Part no. 557T196M5R3H0-12B)
9. Workmanship in accordance with NASA-STD-8739.4, Crimping, Interconnecting, Cables, Harness and wiring.
10. Attach Temporary label to each connector. So that it can be remove before flight.
11. Pins 3, 6, 20, 23, 40 are Guards: not connected.
12. Heat Shrink Tubing – Low Outgassing Material (Space Qualified with Low CVCM & TML, Supply the values of CVCM & TML)

**Table 2: Pin Description of D-Sub 50-pin (4 Nos only) Cable harness Assembly**

| SL NO. | Functional Description | Wire      | Gauge | Specifications      |
|--------|------------------------|-----------|-------|---------------------|
| 01     | Cable Shield           | EMI Braid |       | ALPHA 2179          |
| 02     | +30V                   | Single    | 24    | MIL-W-22759/11      |
| 03     | Guard                  |           |       |                     |
| 04     | +15V                   | Single    | 24    | MIL-W-22759/11      |
| 05     | Spare with 22          | TPS-1a    |       | BELDEN 81553 (77 Ω) |
| 06     | Guard                  | NC        |       |                     |
| 07     | Shutdown+              | TPS-2a    | 24    | BELDEN 81553 (77 Ω) |
| 08     | Cathode Switch+        | TPS-3a    | 24    | BELDEN 81553 (77 Ω) |
| 09     | Cathode Contrl+        | TPS-4a    | 24    | BELDEN 81553 (77 Ω) |
| 10     | MCP Contrl+            | TPS-5a    | 24    | BELDEN 81553 (77 Ω) |
| 11     | Anode Contrl+          | TPS-6a    | 24    | BELDEN 81553 (77 Ω) |
| 12     | HVU Thermistor+        | TPS-7a    | 24    | BELDEN 81553 (77 Ω) |
| 13     | MCP Curr+              | TPS-8a    | 24    | BELDEN 81553 (77 Ω) |
| 14     | Cathode Mon+           | TPS-9a    | 24    | BELDEN 81553 (77 Ω) |

| SL NO. | Functional Description | Wire      | Gauge | Specifications      |
|--------|------------------------|-----------|-------|---------------------|
| 15     | MCP Mon+               | TPS-10a   | 24    | BELDEN 81553 (77 Ω) |
| 16     | Anode Mon+             | TPS-11a   | 24    | BELDEN 81553 (77 Ω) |
| 17     | Cable Shield           | EMI Braid |       | ALPHA 2179          |
| 18     | Spare with 35          | TPS-12a   | 24    | BELDEN 81553 (77 Ω) |
| 19     | Return +30V            | Single    | 24    | MIL-W-22759/11      |
| 20     | Guard                  | NC        |       |                     |
| 21     | -15V                   | Single    | 24    | MIL-W-22759/11      |
| 22     | Spare with 5           | TPS-1b    | 24    |                     |
| 23     | Guard                  | NC        |       |                     |
| 24     | Shutdown-              | TPS-2b    | 24    |                     |
| 25     | Cathode Switch-        | TPS-3b    | 24    |                     |
| 26     | Cathode Contrl-        | TPS-4b    | 24    |                     |
| 27     | MCP Contrl-            | TPS-5b    | 24    |                     |
| 28     | Anode Contrl-          | TPS-6b    | 24    |                     |
| 29     | HVU Thermistor-        | TPS-7b    | 24    |                     |
| 30     | MCP Curr-              | TPS-8b    | 24    |                     |
| 31     | Cathode Mon-           | TPS-9b    | 24    |                     |
| 32     | MCP Mon-               | TPS-10b   | 24    |                     |
| 33     | Anode Mon-             | TPS-11b   | 24    |                     |
| 34     | Shield for (18 35)     | Braid     |       | ALPHA 2162          |
| 35     | Spare with 18          | TPS-12b   | 24    |                     |
| 36     | Shield for (2 19)      |           |       |                     |
| 37     | Shield for (4 21 38)   | Braid     |       | ALPHA 2162          |
| 38     | Return +/-15V          | Single    | 24    | MIL-W-22759/11      |
| 39     | Shield for (5 22)      |           |       |                     |
| 40     | Guard                  |           | NC    |                     |
| 41     | Shield for (7 24)      |           |       |                     |
| 42     | Shield for (8 25)      |           |       |                     |
| 43     | Shield for (9 26)      |           |       |                     |
| 44     | Shield for (10 27)     |           |       |                     |
| 45     | Shield for (11 28)     |           |       |                     |
| 46     | Shield for (12 29)     |           |       |                     |
| 47     | Shield for (13 30)     |           |       |                     |
| 48     | Shield for (14 31)     |           |       |                     |
| 49     | Shield for (15 32)     |           |       |                     |
| 50     | Shield for (16 33)     |           |       |                     |