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# Conversion and Installation Procedure Of256p Rax to Anrax

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***Abstract- The present manuscript deals with the conversion of 256P RAX to AN-RAX and also the installation procedure of 256P RAX to AN-RAX. The 256P RAX uses only 184 lines PSTN subscribers but if we convert it into ANRAX it uses 248 lines PSTN subscribers through V5.2 protocol. The 256P RAX consists of three racks, they are: 1) Power Distribution Panel (PDP), 2)Master Frame & 3)Slave Frame. After the conversion of 256P RAX to AN-RAX we can use the master frame as slave frame and slave frame as master frame, both will be same after the conversion. To do the conversion of 256P RAX some of the cards become redundant and those cards have to be removed. Then the modification will be done for the 256P RAX. The conversion and installation procedure is completely done in five steps. The main objective for converting the 256P RAX we can have the maximum lines for the exchange.***

***KEY WORDS: 256P RAX, ACCESS NETWORK RURAL AUTOMATIC EXCHANGE (AN-RAX), PUBLIC SWITCHING TELEPHONE NETWORK (PSTN), V5.2 protocol Standard interface between LE and AN, Local Exchange (LE), AN-RAX Controller Card (ARC), AN-RAX Interface Card (ARI).***

## I. INTRODUCTION

The 'C-DOT Access Network - Rax' (AN-RAX) will provide the second level of remoting. AN-RAX might be connected to a RSU or directly to the Local Exchange (LE). The AN-RAX supports V5.2 protocol, and handles the functionality of second level of remoting.

The second level of remoting has its scope and role clearly defined. At this level there would neither be any intra switching or call processing activities, nor the AN-RAX would handle the charging, billing and administration functions of subscribers.

AN-RAX provides a transparent link between subscriber and LE. It handles the various subscriber events, the BORSCHT (Battery feed, Over voltage protection, Ringing, Supervision, Coding, Hybrid and Testing) functionalities.

All the administration, call processing, charging, billing, traffic monitoring and switching are performed at LE, where AN-RAX plays the role of front end termination at remote end.

The main feature of AN-RAX is that it provides concentration through V 5.2 protocol, which is used as a signaling protocol between LE and AN-RAX. 248 PSTN subscribers can be supported on two E1 links towards LE. This places the AN-RAXat a level higher than a simple MUX, which is used at third level of remoting. The system can work on one E1 link towards LE.The levels of remoting are shown in the **Figure 1.**

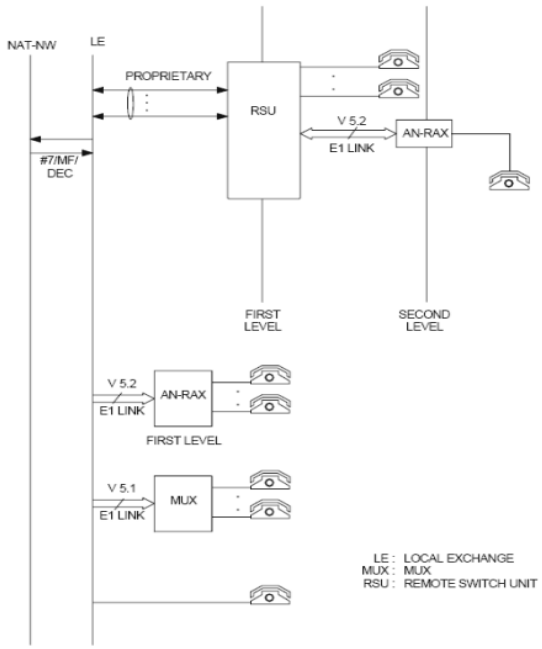


FIG. 1
LEVELS OF REMOTING

## II. EXISTING 256P RAX CONFIGURATION

The list of cards which become redundant and have to be removed are given in the table below.

| Card name | Slot |
|---|---|
| RAT | M9,M18 |
| RMF | M10,M17 |
| CNF(if present) | M7 |
| RSC | M12,M15,S12,S15 |
| RAP | M13,M14 |
| RDS | M21,S21 |
| RDC | M24,S24 |
| RWC | S10,S17 |
| TWT | Wherever present |
| EMF | -do- |
| RDT | -do- |

The maintenance panel is also to be removed.

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The list of cables which have to be completely removed from the system is given below:-

| Sl. No. | Cable marker no. | Signal type name | Source placement frame/connector position. | Destination Placement frame/ connector position |
|---|---|---|---|---|
| 1 | A800 | E&M | Master frame3A (if present) | MDF |
| 2 | A801 | E&M | Master frame4A (if present) | MDF |
| 3 | A802 | E&M | Master frame5A (if present) | MDF |
| 4 | A803 | E&M | Master frame6A (if present) | MDF |
| 5 | A804 | E&M | Slave frame3A (if present) | MDF |
| 6 | A805 | E&M | Slave frame4A (if present) | MDF |
| 7 | A806 | E&M | Slave frame5A (if present) | MDF |
| 8 | A807 | E&M | Slave frame6A (if present) | MDF |
| 9 | DT01 | RDS-RDC(Pair) Cable | Master frame21A (if present) | DDF |
| 10 | MP00 | MPACIA link | Master frame2A POS1 | MP |
| 11 | PRD1 | -48V supply | PDT | MP |
| 12 | DT02 | RWC cable | Slave frame 10A,S17A (if present) | DDF |
| 13 | DTNS | RNS trunk cable | RNS(if present) | MDF |
| 14 | CLC0 CLK0 SYN0 | Clock & Sync. Output for copy0 | RNS(if present) | RAP0 Slot 13 A3 & 13 B3 |
| 15 | CLC1 CLK1 SYN1 | Clock & Sync. Output for copy1. | RNS(if present) | RAP1 Slot 14 A3 & 14 B3 |

## III. MODIFICATION TO BE DONE ON MOTHERBOARD

### *A. Straps On Motherboard*

The motherboard of 256P RAX has to be modified to enable installation of AN-RAX.

The master frame will have 20 straps. The list of straps is given in table. The shrouds of slots 12A & 15A will have to be removed for new straps.

The slave frame needs to have only four of the straps mentioned in the table, but all the 20 straps may be done in slave frame to provide inter changeability in future without major effort. The four straps are Sl.No. 17,18,19& 20 of straps list table.

STRAPS LIST FOR AN-RAX

| Sl.No. | Slot.No.From | Pin No. To. |
|---|---|---|
| 1 | 12/Ba8 | 15/Bc8 |
| 2 | 12/Bc8 | 15/Ba8 |
| 3 | 12/Ba9 | 15/Bc9 |
| 4 | 12/Bc9 | 15/Ba9 |
| 5 | 12/Aa9 | 15/Ac9 |
| 6 | 12/Ac9 | 15/Aa9 |
| 7 | 12/Ba2 | 15/Ba2 |
| 8 | 12/Bc2 | 15/Bc2 |
| 9 | 12/Ba3 | 15/Ba3 |
| 10 | 12/Bc3 | 15/Bc3 |
| 11 | 12/Ba4 | 15/Ba4 |
| 12 | 12/Bc4 | 15/Bc4 |
| 13 | 12/Ba5 | 15/Ba5 |
| 14 | 12/Bc5 | 15/Bc5 |
| 15 | 12/Ba23 | 15/Ba23 |
| 16 | 12/Bc23 | 15/Bc23 |
| 17 | 11/Ac6 | 16/Bc1 |
| 18 | 11/Ac7 | 16/Ac9 |
| 19 | 16/Ac6 | 11/Bc1 |
| 20 | 16/Ac7 | 11/Ac9 |

### *B. Placement Of Precharge Pins*

The precharge pins and back panel grounding nuts have to be provisioned in the motherboard so that they make early contact with ARC/ARI cards as they are jacked in.

Two precharge pins have to be placed in each of the slots 12 & 15. These should replace the screws of the slot.

Back panel grounding nuts have to be provisioned on the motherboard for SPC/ISP card slots 11 & 16.

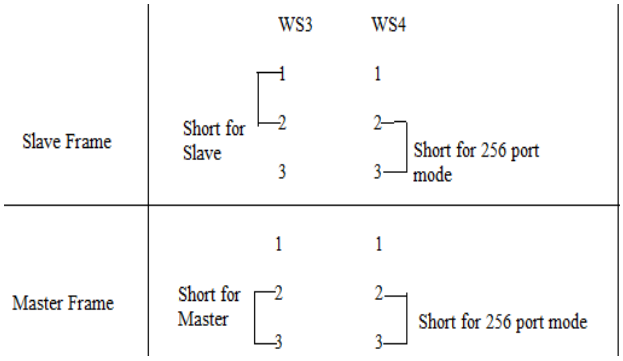
### *C. Placement of New Shrouds*

Two shrouds have to be placed on the motherboard at location 12B & 15B in master frame only. However for inter changeability in the future this can be done on slave frame also.

### *D. Jumper Setting On Motherboard For Configuring Motherboard For Master/Slave and 128/256 Port Mode*

There are two set of 3pin berg stick (Jumper pins) WS3 & WS4 on the back side of 256P RAX motherboard as shown in **figure 2**. Each motherboard of 256P RAX can be configured for Master/Slave and 128/256 port mode by shorting these pin using shorting stubs.

(a) Jumper setting on each motherboard for 256 port mode is to be done as shown below.




As seen from the back side (solder side of motherboard).

(b) For 128 port mode, jumper setting is to be done as shown below.

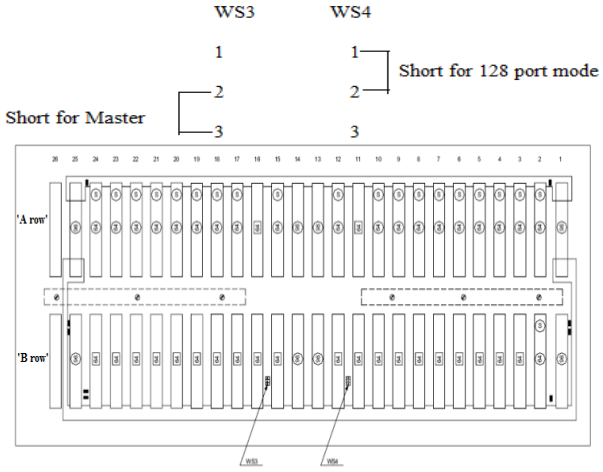



FIG. 2
JUMPER SETTING PINS ON MOTHER BOARD

## IV. PLACEMENT OF CABLES ON MOTHERBOARD

### A. *Back Plane Interframe Cables*

The five interframe cables are to be connected between Master and Slave frames.

| S.N. | Cable Marker No. | Source Placement Connector Position | Destination Placement Connector Position | Cable Description. |
|---|---|---|---|---|
| 1 | IFC0 | Master frame 12A, Pos II | Slave frame 12A, Pos II | 2×7 Flat cable connector |
| 2 | IFC1 | Master frame 12A, Pos I | Slave frame 12A, Pos I | -do- |
| 3 | IFC2 | Master frame 15A, Pos II | Slave frame 15A, Pos II | -do- |
| 4 | IFC3 | Master frame 15A, Pos I | Slave frame 15A, Pos I | -do- |
| 5 | IFC4 | Master frame 2B, Pos I | Slave frame 2B, Pos I | -do- |

The connection details are shown in **fig 3.**

### B. *Digital Link Cable*

Digital link cable terminates two E1 links on the ARC card in one of the copies of Master frame. The other end of the cable is terminated on the DDF (Digital Distribution Frame).

The details of the cable is given in table below.

The connection details are shown in **figure 4.**

| Cable Marker | Source Connector Position | Type | Destination Position | Type |
|---|---|---|---|---|
| DTC1 | Master frame 12B Pos-I or Master frame 15B Pos-I | 7×2 single module connector | Digital Distribution Frame | Bare Wire |

### C. *Dumb Terminal Cable*

The dumb terminal cable is terminated on ARC card in slot 13B & 2A in Master frame.

The details of cable is given in the table below.

| Cable Marker No. | Source Connector Position | Type | Destination Connector Position | Type |
|---|---|---|---|---|
| SDT0 | Master frame 2A Pos-I & 12B Pos-III | 7×2 Single Module Cable | Dumb Terminal RS232-C connector | 25-Pin D-type connector |

The cable details and connector position on Master frame are shown in **figure 5.**

**NOTE:** Before switching on the dumb terminal, it should be well checked that the earthing of the AC main supply and AN-RAX have been properly done.

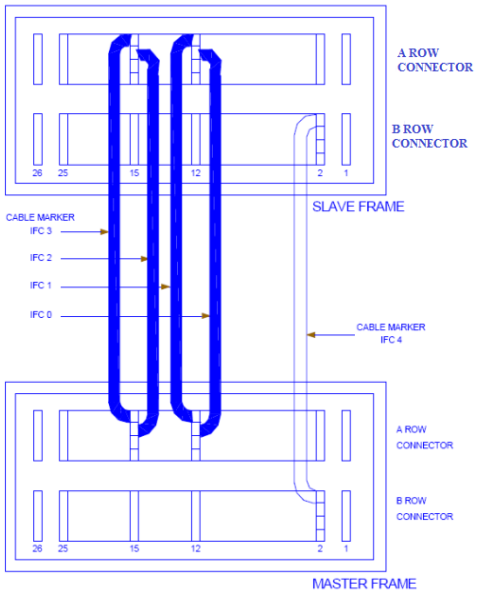



FIG. 3
INTER FRAME CABLE TERMINATION

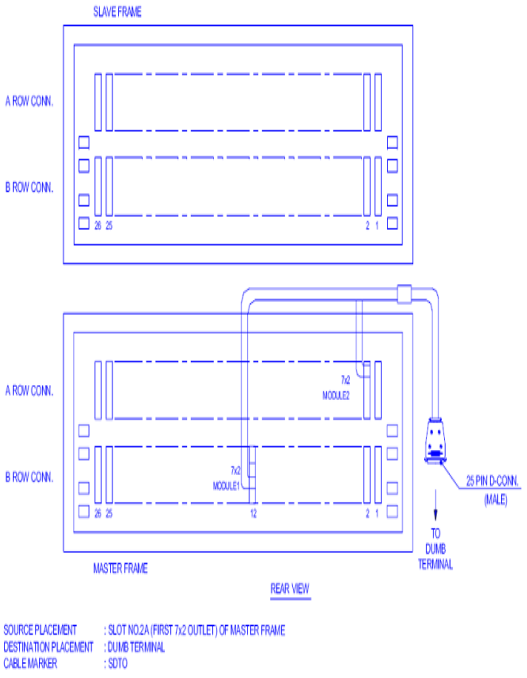



FIG. 5
DUMB TERMINAL INTERFACE CABLE

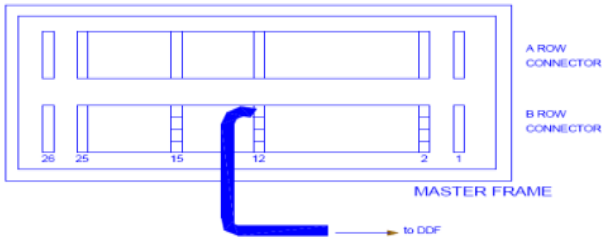



**FIG. 4**
**DIGITAL LINK CABLE TERMINATION**

## V. NEW HARDWARE

### *A. New Cards*

The new hardware card for AN-RAX are listed in the table below:-

| | |
|---|---|
| [1] Card Name | [2] Positions |
| [3] AN-RAX Controller Card (ARC) | [4] M12 & M15 |
| [5] AN-RAX Interface Card (ARI) | [6] S12 & S15 |

The new hardware configuration is shown in **figure 6.**

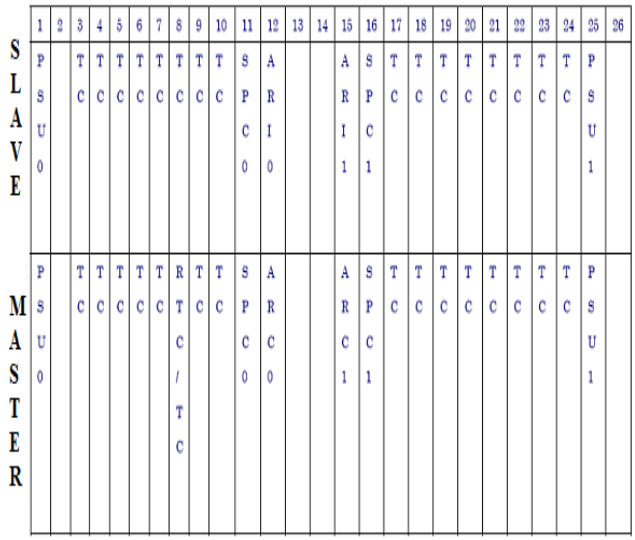



**FIG.6**

FIG. 6: AN-RAX CARD FRAME CONFIGURATION
TC: Termination Card i.e. LCC or CCM

### *B. NEW CABLES*

The ARC & ARI cards are connected by 60 pin flat cable from the front of the cards as shown in **fig.7.**

The cable connection details are in table below.

| Sl.No. | Cable Marker | Source Placement Position | Destination Connector Position |
|---|---|---|---|
| 1 | ACI 0 | ARC FRONT, Master Frame slot 12 | ARI FRONT, Slave Frame slot 12 |
| 2 | ACI 1 | ARC FRONT, Master Frame slot 15 | ARI FRONT, Slave Frame slot 15. |

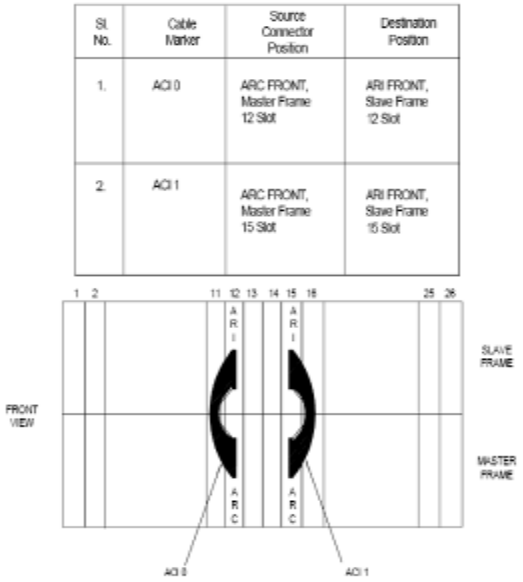



**FIG.7**
**CABLE CONNECTION BETWEEN ARC & ARI CARD**

## VI. MAPPING OF L3 ADDRESSES TO AN-RAX HARDWARE SLOTS

The mapping L3 addresses as defined at LE and AN to the actual hardware port of line cards is shown in the table below. It is being assumed that the 'start L3 address' is 101 and all 248 possible subscribers are present.

| Sl.No. | Card Slot | L3 Addresses |
|---|---|---|
| 1 | 1-3 | 101-108 |
| 2 | 1-4 | 109-116 |
| 3 | 1-5 | 117-124 |
| 4 | 1-6 | 125-132 |
| 5 | 1-7 | 133-140 |
| 6 | 1-8 Note 1 | 141-148 |
| 7 | 1-9 | 149-156 |
| 8 | 1-10 | 157-164 |
| 9 | 1-17 | 165-172 |
| 10 | 1-18 | 173-180 |
| 11 | 1-19 | 181-188 |
| 12 | 1-20 | 189-196 |
| 13 | 1-21 | 197-204 |
| 14 | 1-22 | 205-212 |
| 15 | 1-23 | 213-220 |
| 16 | 1-24 | 221-228 |
| 17 | 2-3 | 229-236 |
| 18 | 2-4 | 237-244 |
| 19 | 2-5 | 245-252 |
| 20 | 2-6 | 253-260 |
| 21 | 2-7 | 261-268 |
| 22 | 2-8 | 269-276 |
| 23 | 2-9 | 277-284 |
| 24 | 2-10 | 285-292 |
| 25 | 2-17 | 293-300 |
| 26 | 2-18 | 301-308 |
| 27 | 2-19 | 309-316 |
| 28 | 2-20 | 317-324 |
| 29 | 2-21 | 325-332 |
| 30 | 2-22 | 333-340 |
| 31 | 2-23 | 341-348 |
| 32 | 2-24 | 349-356 |

**NOTE:** If an RTC card is placed in the slot, leave the corresponding 8 L3 addresses in sequence. The 8 L3 addresses should not be given to any subscriber. They should not be made in service at AN.

**NOTE:** If the start L3 address programmed at LE is 201, then the L3 address of slot 1-3 will begin from 201, slot 1-4 will begin 209 and so on.

## VII. CONCLUSION

The 256P AN-RAX is ideal for rural applications since it provides immediate basic telephone connections with minimal infrastructure. It is an easy to install fault-tolerant system with inbuilt redundancy.

Communication has forever been a problem in villages of the world. The world, as we know it, has been progressing rapidly, leaving these villages bereft of substantial social and economic gains.

The 256P AN-RAX from C-DOT is a world class cost-effective communication solution for rural areas. Development with the sole purpose of transforming the villages by removing natural barriers to progress through its versatility in any environment hot tropical areas, subzero mountainsous regions, vast deserts and costal areas, the 256P AN-RAX is an Access Network product.

Besides requiring no air-conditioning, it can withstand dust, wide temperature fluctuations (-50 C to 500 C), humidity and salinity. Moreover, it consumes very little power, sustaining itself despite frequent power failures due to low battery drain.

A distinguishing feature of the 256P AN-RAX is its simple and flexible connectivity through a wide range of transmission systems such as UHF, VHF, radio and satellite.

Because it is program-controlled it can be easily integrated as per the network requirements through man-machine commands, thus providing to be an extremely cost-effective and viable proposition.It can also assist in the setting up of service centers in any country that imports its technology and provide training to their technicians with the objective of making themselves reliant in handling technical problems.

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