



National Centre for Radio Astrophysics

Internal Technical Report

On

Integration of legacy Online Sentinel system Parameters with new TGC system

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| Ver. 1.1 | 18-07-2023 | Bhavesh kunbi | Charu kanade/ Raj Uprade | - Interfacing Cable installation time added in section 3 and 5. |

Index

| | |
|--|----|
| 1) <i>Abstract</i> | 4 |
| 2) <i>Introduction</i> | 4 |
| 3) <i>Hardware Connection details with online system</i> | 5 |
| 4) <i>Web base Monitoring tool for TGC system</i> | 9 |
| 5) <i>Conclusion</i> | 10 |

Abbreviations:

| | |
|----------------------|--|
| <i>TGC</i> | <i>Tango based GMRT Control and Monitoring system</i> |
| <i>TANGO</i> | <i>Taco based Next Generation Objects</i> |
| <i>LMC</i> | <i>Local Monitoring and Control</i> |
| <i>MCM</i> | <i>Monitoring and Control Module</i> |
| <i>GMRT</i> | <i>Giant Metrewave Radio Telescope</i> |
| <i>ANTCOM</i> | <i>Antenna Base Computer</i> |

Figures:

| | |
|--------------------------|---|
| <i>Fig 2.1</i> | <i>Sentinel system sensors</i> |
| <i>Fig 3.1 -A</i> | <i>ANTCOM PIU back side image</i> |
| <i>Fig 3.1 -B</i> | <i>OFCSNT Rabbit card back side image</i> |
| <i>Fig 3.2</i> | <i>New Monitoring cable</i> |
| <i>Fig 3.3</i> | <i>Raw value and voltages on Rabbit web page</i> |
| <i>Fig 4.1</i> | <i>Sentinel and Power supply Monitoring window</i> |
| <i>Fig 4.2</i> | <i>Three Phase Monitoring log</i> |
| <i>Fig 4.3</i> | <i>Antenna Base Temperature Log</i> |

1) Abstract

GMRT consists of an array of 30 fully steerable parabolic dishes, each of 45- m in diameter, located over a region of about 25 Kms. All the antenna shell equipped with various sub system (*FE, OFC, TGC, Servo, Analog and Digital Backend etc.*) electronics hardware's to control antenna for providing best results to radio astronomy. So it is necessary to provides safety and protection to all sub-systems from fire, smoke and high temperature. In legacy online system all antenna base parameters are getting monitored in CEB using web based tool. GMRT sentinel system is taking responsibility of C&M of all these parameters. As a part of upgrade now Control and Monitoring facility is taken care by new TGC system. So it is necessary to enable monitoring facility in upgraded TGC system for monitor sentinel system parameters and it's logs to identify fault at the antenna base.

2) Introduction

In GMRT legacy system sentinel parameters are getting monitoring using antenna base computer called is as ANTCOM. This ANTCOM is the vital Antenna base computer located in each of the antenna shells. It receives various parameters sent by COMH and performs all the tasks and passes the vital information to various systems like Servo Control Computer, MCM-s and FPS. MCM Card is a general purpose Micro-controller based card which provides 16 TTL Control O/P-s and monitors 64 analog signals. Antenna base have various sentinel systems hardware like Smoke Unit, Temperature monitoring unit, MSEB/DGSET 3 Phase monitoring unit and New Rabbit processor (RCM 4300) as shown in below **Figure 2.1**.



a) Temperature Monitoring Unit



b) Smoke & Fire Alarm Sensor



c) MSEB/DGSET power monitoring Unit



d) Rabbit card (RCM 4300)

Fig 2.1) Sentinel system sensors and OFCSNT Rabbit card

Technical details of these sentinel system sensors are mentioned in **Table 2.1**

Table 2.1) Sentinel system sensors details

| Sr. No | Monitoring Hardware | Technical details | Location | Nos. @ antenna base |
|---------------|-------------------------------|--|---|----------------------------|
| 1 | Temperature sensor | National Semiconductor make LM-35 (0-100 degC) , O/p: 10mV/degC, Resolution of 0.5degC | At all 30 antennae | 1 |
| 2 | Smoke & Fire detection sensor | System Sensor make Americium-241 based ionization Smoke Detector-1412B. | At All 30 antennae one above the Servo System racks, one above the Receiver System racks and one above the Electrical power distribution box. | 3 |
| 3 | MSEB Unit | Transformer , Bridge rectifier, Filter circuit | Near Electrical Power distribution panel | 1 |
| 4 | Rabbit Card | 64 monitoring channel, 32 Control O/P | At all 30 antennae (called as OFCSNT rabbit card) | 1 |

3) Hardware Connection details with online system

To integrate all sentinel system parameters and 3 Phase monitoring unit status with new TGC based system we used antenna based Ofcsnt rabbit card to read all this parameters through ANTCOM. This Antenna base Computer in online system is used to monitor those parameters. It has two 32 bit monitoring port as shown in **Fig 3.1-(A)**. Telemetry team mapped the pin connection and designed new monitoring connector cable as show in **Fig 3.2** to connect ANTCOM and ofcsnt. We tapped wire from Monitoring port 2 and connected to ofcsnt Rabbit MCM card at port 2. In existing ofcsnt card we have spared monitoring channel from that we used total 15 (Ch no. 50 to 64) channel to integrate with existing sentinel system. Pin configuration of ofcsnt Rabbit card is showing in **Fig 3.2**. Telemetry team has completed interfacing work at all 30 antennae in **Oct' 2020 MTAC**.

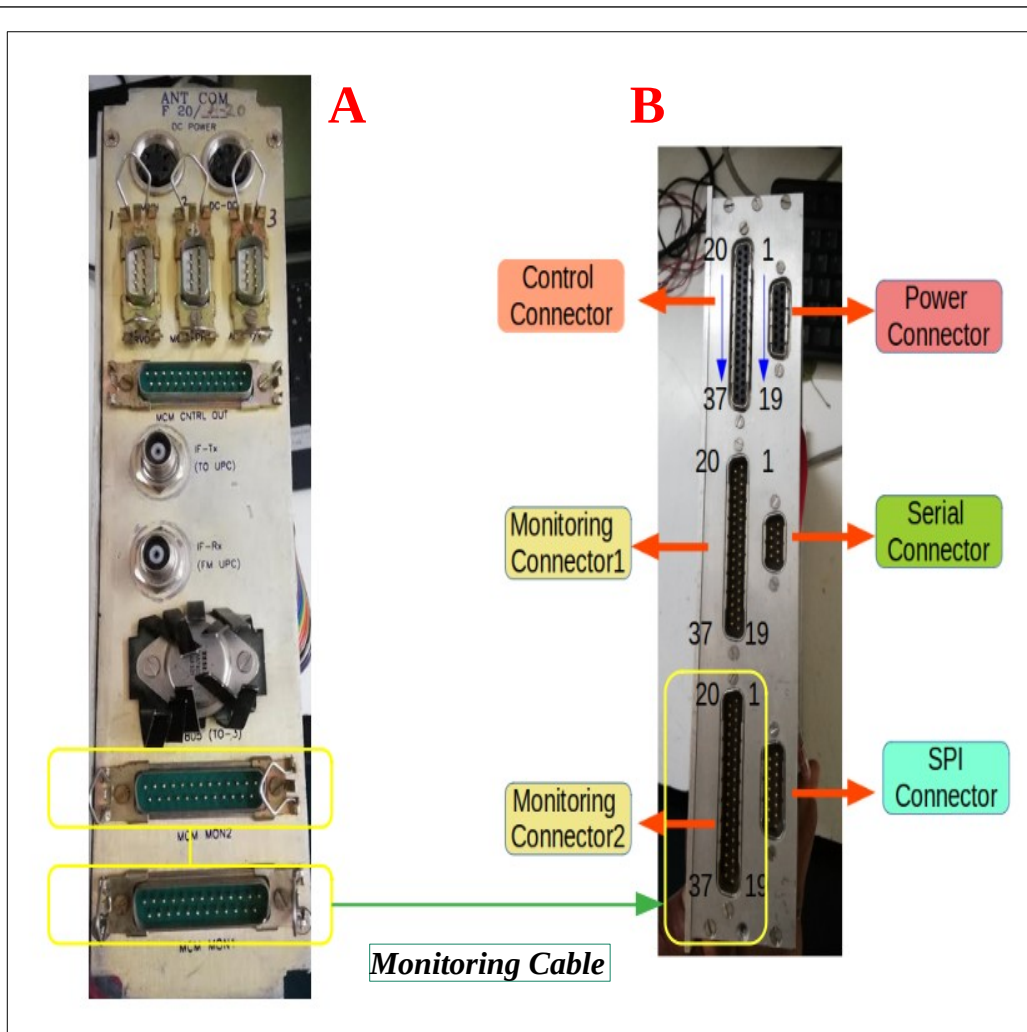


Fig 3.1) Connection between Antcom and Ofcsnt rabbit card

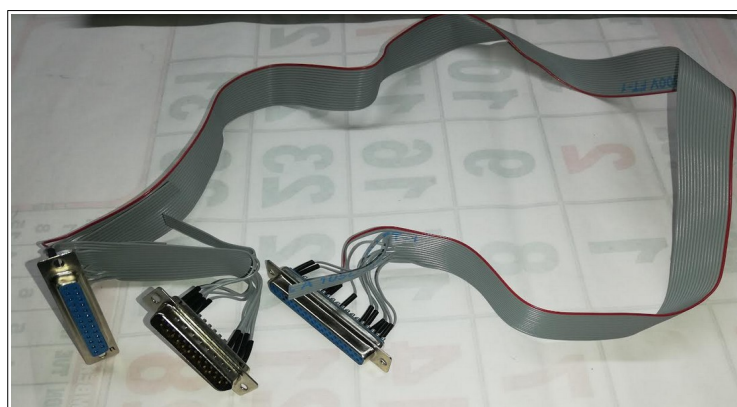


Fig 3.2) New Monitoring cable

Pin mapping between Antcom and Ofcsnt Rabbit card is mentioned in **Table 3.1**

Table 3.1) Pin mapping details between Rabbit card and ANTCOM

| Rabbit box Connector pin | MCM Monitoring channel | Parameters Name | Descriptions/ ANTCOM pin |
|---------------------------------|-------------------------------|------------------------|---|
| 55 | 50 | MSEB _R | MSEB POWER (Antcom MON Port 1 Pin no-11) |
| 56 | 51 | MSEB _Y | MSEB POWER (Antcom MON Port 1 Pin no-12) |
| 57 | 52 | MSEB _B | MSEB POWER (Antcom MON Port 1 Pin no-13) |
| 58 | 53 | DGSET_R | DGSET POWER (Antcom MON Port 1 Pin no-14) |
| 59 | 54 | DGSET_Y | DGSET POWER (Antcom MON Port 1 Pin no-15) |
| 60 | 55 | DGSET_B | DGSET POWER (Antcom MON Port 1 Pin no-16) |
| 61 | 56 | INTLOCK | Interlock status (Antcom MON Port 1 Pin no-3) |
| 62 | 57 | INTROPOW | Intruder sensor DC power |
| 63 | 58 | INTRO | Intruder sensor |
| 64 | 59 | SMOKEPOW | Smoke sensor DC power |
| 65 | 60 | SMOKE | Smoke sensor (Antcom MON Port 1 Pin no-10) |
| 66 | 61 | TEMP2POW | Temp. sensor 2 DC power |
| 67 | 62 | TEMP1POW | Temp. sensor 1 DC power |
| 68 | 63 | TEMP2 | Temp. sensor 2 (Antcom MON Port 1 Pin no-2) |
| 69 | 64 | TEMP1 | Temp. sensor 1 (Antcom MON Port 1 Pin no-1) |

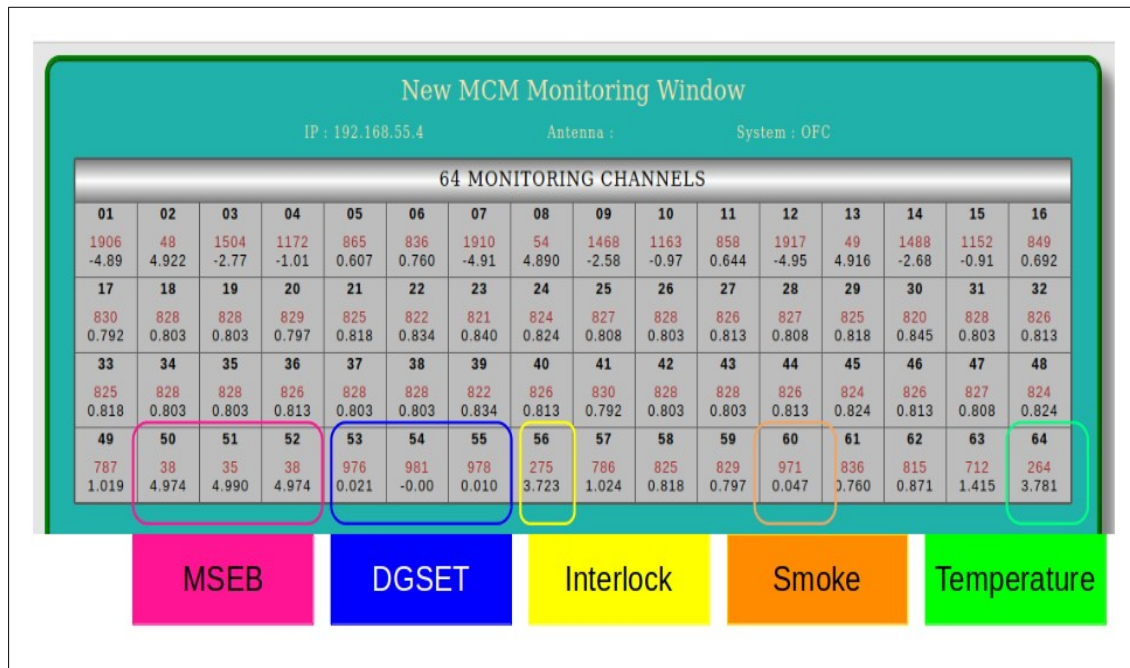


Fig 3.3) Raw value and voltage on Rabbit web page

To check raw voltage of monitoring points for any antenna need to be open particular antenna Ofsnt Rabbit IP.

Example: 192.168.XX.4 , (where, XX = 31 to 60)

Once you open particular antenna IP in browser you will see the web page as shown in **Fig 3.5** it will show you the raw voltages of 64 monitoring channel of Ofsnt Rabbit MCM card. As shown in above figure channel No **50, 51, 52, 53, 54, 55, 56, 60, 64** are used to monitor sentinel system sensor readings and three phase power supply unit status.

Table 3.2) Channel voltages

| Rabbit MCM Channel No | Description | Voltage |
|-----------------------|--|--|
| 50, 51, 52 | It show the status of MSEB (R,Y,B) power supply | ~ 4.9 V = MSEB phase ON 0 V = MSEB phase OFF |
| 53, 54, 55 | It show the status of DGSET (R,Y,B) power supply | ~ 4.9 V = DGSET phase ON 0 V = DGSET phase OFF |
| 56 | It show the status of interlock circuit | ~3.7 V = Interlock circuit OFF 0 V = Interlock circuit ON |
| 60 | It show the status of Smoke sensor | 0 V = No Smoke |

| | | |
|----|--|--------------------|
| | | 5 V = Smoke |
| 64 | It show the status of Temperature sensor | Temp = F (Voltage) |

Temperature Conversion Formula from raw voltage, ($rw[x]$ = Raw voltage of 'x' channel)

$$Temp (^\circ C) = ((((980 - rw [64]) / 196.0) * 1.035) / 5.0) * 100;$$

4) Web base Monitoring tool for TGC system

All Sentinel system and DGSET/MSEB parameters logs are available on GMRT web tool developed by *Shri Santaji katore*. Below logs we can see on the web tool.

http://www.gmrt.ncra.tifr.res.in/gmrt_users/help/eng_tools.html

- Antenna Base Temperature
- Central Lab temperature
- Power Supply
- Smoke detector
- Antenna Link
- Alarm log

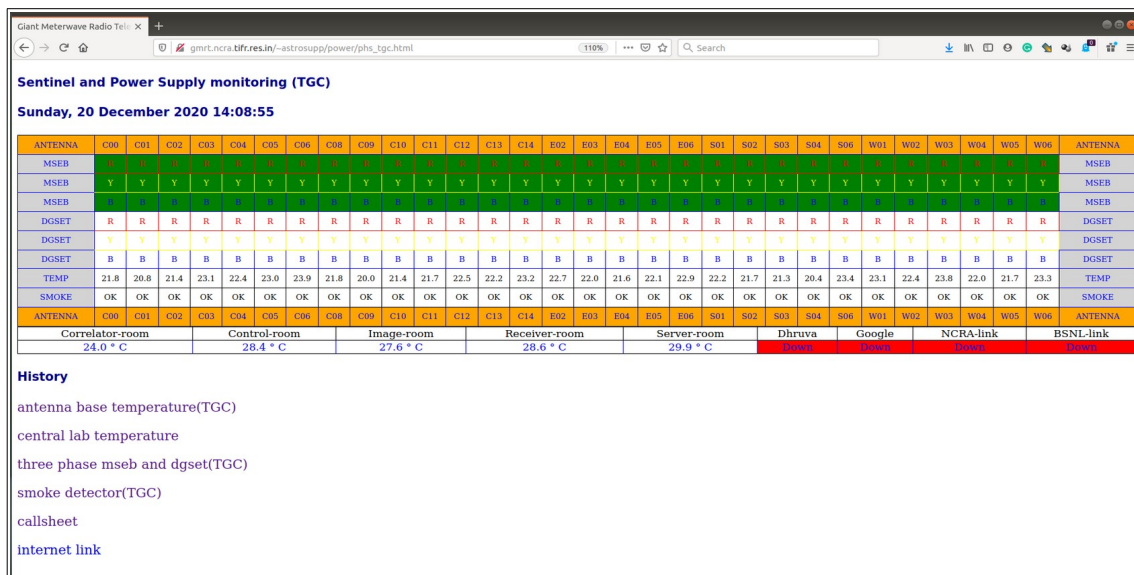


Fig 4.1) Sentinel and Power supply Monitoring window

5) Conclusion

- Telemetry team has completed (Oct 2020 – MTAC) interfacing cable between ANTCOM and Rabbit PIU to monitor sentinel and three phase power status for new TGC system.
- This monitoring facility is useful for all Labs to identify fault by checking logs.
- All sentinel system parameter (Temperature, Fire and Smoke) logs are available on single web page to identify type of fault occurred at antenna base. It will reduce the downtime.

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|---|---|
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| Web Page Related work | Shri. Santaji Katore |