



**RADIO ASTRONOMY CENTRE  
NATIONAL CENTRE FOR RADIO ASTROPHYSICS**

INTERNAL REPORT NUMBER: NCRA-OOTY/R302

**PROCEDURE TO BE FOLLOWED AFTER ENCODER  
TRIPS THE POWER SUPPLY TO ORT**

Author: SRIRAM P  
E-mail: [shriram@ncra.tifr.res.in](mailto:shriram@ncra.tifr.res.in)

**OBJECTIVE:** To describe the set of activities to be followed with ownership details for Restoring the power supply to ORT after Encoder trips the power supply to ORT

<b>APPROVAL BLOCK</b>		
<u>APPROVALS</u>	<u>TITLE</u>	<u>SIGNATURE</u>
<b>PREPARED BY</b>	<b>SRIRAM P</b>	
<b>REVIEWED BY</b>		
<b>APPROVED BY</b>		

<b>Revision</b>	<b>Date</b>	<b>Modification/change</b>
<b>Ver 1</b>	<b>July 07, 2020</b>	

# **SUMMARY**

ORT (ooty Radio telescope) commissioned in the early of 1970 in 11.25 degree slope and 530 meter long. It includes total 4nos drive platforms, servo platform and 20nos non drive platform and each platform is connected with each other using 4 inch drive pipe shaft. One of the safety systems available with ORT is encoder system. It is designed to trip the power supply to ORT when the radial misalignment between the drive pipe shafts is equal or more than 60 degree.

Main intension of this document preparation is to describe the step by step procedure to be followed to restore the power supply to ORT after encoder trips the power supply to ORT.

All activities are described with ownership details and followed by annexures and appendix.

**If the encoders have tripped the power supply to ORT, then follow this SOP.**

Encoders are set to trip the power supply to ORT @ 60 degrees of the over travel of the drive shaft pipe

&

Differential Synchros are set to trip the power supply to ORT @ 90 degrees of the over travel of the drive shaft pipe.

STEP	ACTIVITY DETAILS	RESPONSIBILITY
1 a	Inform to Mechanical,Electrical,Electronics departments immediately after encoder trips the power to ORT	Oberver
1 b	Inform the status of ORT rotation during which this above trip occurred ( whether it is during TRACK or SLEW )	Observer
2	Collect the encoder log / recorded data immediately after the encoder trips the power to ORT.	Electronics Dept
3	Identify which side of the encoder is over travelled (rotated) >60 deg.	Electronics,Electrical &Mechanical Dept
	<b>NO TRIAL ROTATION IS PERMITTED WITHOUT IDENTIFYING THE CUT-LOACTION OR THE PROBLEM.</b>	
4	<p style="text-align: center;"><b>IN TRACK MODE :-</b></p> <p><b>If the side encoder is over travelled (rotated) &amp; the South Encoder is stand-still condition,</b> then it is confirming that the discontinuity is somewhere between Servo-Platform to South side.<b>(please refer appendix I)</b></p> <p><b>However, Check for the encoder cable connector @ S-12 &amp; its Junction Box &amp; confirm all the connections are proper. (Follow from STEP 8).</b></p>	Mechanical / Electronics Dept
5	<p style="text-align: center;"><b>IN TRACK MODE :-</b></p> <p><b>If the South side encoder is over travelled (rotated) &amp; the North Encoder is stand-still condition,</b> then it is confirming that the discontinuity is somewhere between Servo platform to North side. <b>(please refer appendix I)</b></p> <p><b>However, Check for the encoder cable connector @ N-12 &amp; its Junction Box &amp; confirm all the connections are proper. (Follow from STEP 8)</b></p>	Mechanical / Electronics Dept
6	<p style="text-align: center;"><b>IN SLEW MODE :-</b></p> <p><b>If the South side encoder is over rotated In slew mode &amp; the North Encoder is stand-still condition,</b> then Discontinuity is somewhere between N10 to N12 platform.<b>However, Check for the encoder cable connector @ N-12 &amp;</b></p>	Mechanical / Electronics Dept

	<p><b>its Junction Box &amp; confirm all the connections are proper.</b>  <b>(Follow from STEP 8)</b></p>	
7	<p><b>IN SLEW MODE :-</b>  <b>If the North side encoder is over rotated In slew mode &amp; the South Encoder is stand-still condition,</b>  then Discontinuity is somewhere between S10 to S12 platform.</p> <p><b>However, Check for the encoder cable connector @ S-12 &amp; its Junction Box &amp; confirm all the connections are proper.</b>  <b>(Follow from STEP 8)</b></p>	Mechanical / Electronics Dept
8	<p>Inspect for any CUT / Discontinuity visually from ground level at first .  <b>(If the problem is identified, follow from STEP 10)</b></p>	Electronics, Electrical & Mechanical Dept & Observer
9	<p>If CUT / discontinuity is not identified by <b>STEP-8</b> , then all platforms ( as mentioned in above situations) shall be thoroughly inspected by all the RAC Staff till the cut-location OR the problem is indentified.  <b>( After the problem is identified, follow from STEP 10)</b></p>	Electronics, Electrical & Mechanical Dept & Observer
10	<p>Rectification work shall be carried out by the concerned department staff as per the approved Procedure &amp; restore the ORT to its operating condition.</p>	Electronics, Electrical & Mechanical Dept & Observer
11	<p>After rectification work <b>Annexure-A</b> to be signed by the concerned Dept to obtain approval to follow <b>STEP 12</b>.</p>	Electronics, Electrical & Mechanical Dept & Observer
12	<p>A) Encoder is reset to bring back the power to ORT and <b>Annexure B</b> shall be filled.  B) Trial rotations should be taken both in Track &amp; Slew modes in presence of All the Section Heads.</p>	Mechanical , Electrical & Electronics Dept.
13	<p>After satisfactory trial testing, bring ORT to west limit position &amp; measure <b>Q- Height READING &amp; Compare it with old recorded values.</b>  <b>Annexure-C Shall be filled &amp; signed by all the concerned.</b></p> <p><b><u>Now onwards, these new set of Q-Height readings will now be the base readings.</u></b></p>	Mechanical , Electrical & Electronics Dept.
14	<p>ORT will be released for Observations.</p>	Mechanical , Electrical & Electronics Dept
15	<p>Detailed report is to be generated by all the concerned Dept section Heads &amp; to be kept in records.</p>	Mechanical , Electrical & Electronics Dept.

## **ANNEXURE - A**

All Rectification works are carried out & restored the ORT to its normal Operating Condition. Now we all certify that ORT be rotated to its west limit for Q-Height Measurements.

<b>WITNESSED BY DEPARTMENT</b>	<b>SIGNATURE</b>	<b>DATE</b>
<b>MECHANICAL</b>		
<b>ELECTRICAL</b>		
<b>ELECTRONICS</b>		

**ANNEXURE-B**

**ORIGINAL , TRIPPED, RESET**  
**ENCODER-VALUES**

<b>As per the SOFTWARE</b>	<b>S12 ENCODER</b>		<b>N12 ENCODER</b>	
	<b>Encoder ORIGINAL READINGS (as on date:- )</b>	No.of Rotoation	No. of Division	No.of Rotoation
<b>At the time of trip (as on date:- )</b>	No.of Rotoation	No. of Division	No.of Rotoation	No. of Division
<b>After Reset (as on date:- )</b>	No.of Rotoation	No. of Division	No.of Rotoation	No. of Division
<b>NEW REFERENCE Encoder readings (as on date:- )</b>	No.of Rotoation	No. of Division	No.of Rotoation	No. of Division

**(Electronics)**

**(Mechanical)**

**( Electrical)**

## ANNEXURE – C

**Date:-**

<b>TOWER NO</b>	<b>Q –Height READING (mm) (after rectification works)</b>	<b>Q –Height READING (mm)OLD (17-01-2019)</b>	<b>REMARKS</b>
N12		5435	
N11		2170	
N10		2165	
N9		2040	
N8		1690	
N7		1895	
N6		2130	
N5		1800	
N4		1595	
N3		2180	
N2		2700	
N1		3305	
S1		3920	
S2		4450	
S3		3110	
S4		2790	
S5		2915	
S6		3242	
S7		3425	
S8		3125	
S9		2450	
S10		2035	
S11		2080	
S12		1650	

- I. **Q – Readings are found satisfactory and ORT can be operated.**
- II. **ORT is herewith released for observations.**

**(Mechanical)**

**( Electrical)**

**(Electronics)**

## **APPENDIX I**

To examine the response of ENCODER SYSTEM based upon the various cut locations of drive pipe shaft, trial was taken in test bench by disconnecting the respective coupling to create the drive pipe shaft cut scenario at respective location as below,

### **EAST to WEST rotation of ORT in SLEW MODE:**

<b>DRIVE PIPE SHAFT CUT LOCATION</b>	<b>MODE</b>	<b>RESULT</b>
BETWEEN N4 TO S4	SLEW	NO Tripping
BETWEEN N4 TO N10	SLEW	NO Tripping
BETWEEN N10 TO N12	SLEW	Tripped
BETWEEN S4 TO S10	SLEW	NO Tripping
BETWEEN S10 TO S12	SLEW	Tripped

### **WEST to EAST rotation of ORT in SLEW MODE:**

<b>DRIVE PIPE SHAFT CUT LOCATION</b>	<b>MODE</b>	<b>RESULT</b>
BETWEEN N4 TO S4	SLEW	NO Tripping
BETWEEN N4 TO N10	SLEW	NO Tripping
BETWEEN N10 TO N12	SLEW	Tripped
BETWEEN S4 TO S10	SLEW	NO Tripping
BETWEEN S10 TO S12	SLEW	Tripped

### **EAST to WEST rotation of ORT in TRACK MODE:**

<b>DRIVE PIPE SHAFT CUT LOCATION</b>	<b>MODE</b>	<b>RESULT</b>
BETWEEN TRACK PLATFORM TO N4	TRACK	Tripped
BETWEEN N4 TO N10	TRACK	Tripped
BETWEEN N10 TO N12	TRACK	Tripped
BETWEEN TRACK PLATFORM TO S4	TRACK	Tripped
BETWEEN N4 TO S10	TRACK	Tripped
BETWEEN N10 TO S12	TRACK	Tripped

Above results were obtained from ORT test bench setup and it will be helpful in identifying the drive pipe shaft cut location by just knowing the direction of rotation and mode of operation of ORT.