



## **Doppler Weather Radar**

### **Fault Diagnosis Manual**

**O/o DDGM, Regional Meteorological Center, Mumbai, India - 400005**



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**



### FAULT DIAGONISIS MANUAL FOR DOPPLER WEATHER RADAR-BEL MK II

GOVT. OF INDIA  
MINISTRY OF EARTH SCIENCES,  
INDIA METEOROLOGICAL DEPARTMENT,  
REGIONAL METEOROLOGICAL CENTER MUMBAI

Compiled by  
Jan Mohmmad  
Elphin Andrew

O/o DDGM, Regional Meteorological Center, Mumbai, India - 400005

Telefax: 22151989



## Fault Diagnosis Manual (FDM– 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

### ACKNOWLEDGEMENT

We have taken efforts in this project. However, it would not have been possible without the kind support and help of many individuals and organizations. I would like to extend my sincere thanks to all of them.

We are highly indebted to **Sh. K C Sai Krishnan**, Scientist F & **Sh. K. S. Hosalikar** Scientist F, for their guidance and constant supervision as well as for providing necessary information regarding the Report & also for their support in completing the Report.

We would like to express my gratitude towards my parents & member of INDIA METEOROLOGICAL DEPARTMENT (IMD) for their kind co-operation and encouragement which help me in completion of this project.

Our thanks and appreciations also go to my colleague in developing the project and people who have willingly helped me out with their abilities.



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

### TABLE OF CONTENTS

Sr.no	Contents	Page no
1	Special Safety Instructions	5
2	Servo problem	12
3	Server problem	20
4	Workstation	23
5.	Transmitter	29
6	GSP, ARC ,Receiver & Test UNIT	32
7	Other issues	



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

## SPECIAL SAFETY INSTRUCTIONS

### INTRODUCTION

1. This Appendix provides the following safety guidelines for personnel:

- (a) High Voltage Equipment Operating Guidelines
- (b) Microwave Radiation Operating Guidelines
- (c) Physical Safety Guidelines

### HIGH VOLTAGE EQUIPMENT

- This guideline document presents operating practices for operators and technicians who work with high voltage equipment. In the context of this discussion any voltage that is lethal is viewed as "high voltage". Therefore, even prime power (100 to 480 VAC) is dangerous because prime power potentials have been known to cause death or injury.
- Electrical circuits operate quickly and do not allow a careless individual a second chance. When dealing with high voltage, the results are very consistent and predictable. The hazards associated with high voltage are always present. The fact that the control switch says OFF does not mean you are safe. Many high voltage circuits are like loaded guns. In general, you cannot see a high voltage hazard. You can learn to recognize situations that present a threat and how to avoid them. Note: The guidelines presented in this document are not academic. They are based on the experience of engine
- eers and technicians who have years of experience with high voltage circuits.
- As stated earlier, any voltage that will kill you should be treated as high voltage. Voltages associated with prime power generally do not jump the air gap between people and the equipment. Usually exposed circuit elements such as a terminal, bare piece of wire, or some non-insulated surface must be touched.



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

- One of the problems associated with prime power is that some equipment can be "floating" above ground. In this case, if you place one hand on the equipment chassis and the other on earth ground, you can be jolted, injured, or killed. 480VAC can stimulate an involuntary muscle response that can literally throw you across a room or seize and hold you across the voltage terminals. 600 or more volts can hold you indefinitely. If the potential is sufficient to drive 200 milliamps through your body you will be held indefinitely. Some people consider the 200 to 600 volt range to be worse than potentials of thousands of volts.

### General High Voltage Guidelines

**In addition to the above, the following practices have proven effective for personnel who deal with high voltage equipment.**

- Hands off. Avoid contact with any potential source of high voltage. Keep hands out of the equipment when it is operating.
- Avoid accidental contact. Make sure that some other part of your body does not come in contact with the high voltage circuits. It is easy to forget the hazards when you are concentrating on a frustrating or interesting task. Pens and badges in shirt pockets could contact the equipment.
- Never work on high voltage circuits when you are alone. If anything should happen to you, your only chance may be prompt action by some other person. Be sure someone else is present and knows what to do in any emergency (e.g., how to shut equipment off, first aid, who to call, etc.)
- Use one hand when working with high voltage circuits. Many people recommend that you put one hand in your pocket when you use a probe or other piece of equipment inside a high voltage section.



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

- Do not float measuring equipment above ground. Make all measurements with respect to ground. If you float an instrument, do not reach inside the equipment. Although it is more difficult to get the right setup, it is well worth the effort.
- Do not assume that the level of risk is a function of size. Some large high power voltage equipment looks docile. One reason the equipment is so big is to get the proper separation between high voltage points. On the other hand, just because the equipment is small is no assurance of safety. Dense packaging results in more difficult access and increases the chance that you will accidentally hit the wrong point.
- Always discharge high voltage capacitors. High voltage capacitors store a lot of energy for long periods of time. High voltage capacitors also exhibit a "memory" in that they can recover after discharge and reach lethal levels. In addition to the "memory" problem, there have been instances where the built-in safety features have failed or have been mis-wired. Each and every time you go to work on a piece of high voltage equipment, use a discharge device with a long handle to discharge every high voltage capacitor.
- Do not depend on the automatic features of the equipment to save you. You never know when someone has left a circuit disabled, if there has been a wiring error, or if a component has failed.
- Take personal responsibility to assure that no one can turn on the high voltage circuits when you are working on the equipment. Precautions would include taping down (or installing a keeper) on controls/circuit breakers and/or disconnecting the power source to the high voltage circuits, activating interlocks that prevent high voltage turn on, etc. Know where the disconnects are and use them. Do NOT rely on anyone not to turn on the high voltage.
- Set up your test equipment with the power off. Conduct the power-on operations when you have your hands out of the equipment.
- Do not use short probes for high voltage measurements. A short probe does not allow any margin for error. If your hand slips you could accidentally come into contact with a danger point. A long probe avoids the whole problem.
- Read the instruction manual. The best insurance is foreknowledge of hazards.
- Create a favorable environment for safe operations. This means that if people are crowding you, stop the operation if it involves high voltage. Pressure can lead to



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

carelessness. In the same way, fatigue is also an enemy. **STAY ALERT AT ALL TIMES WHEN WORKING WITH HIGH VOLTAGE.**

- Do not become over-confident. Maintain a healthy respect for high voltage. A good operating practice is to check the potential between the equipment chassis and earth ground before you complete the circuit with your body. As voltage levels increase, the protection you get from insulation and air gap diminishes.
- If you do not know how the equipment works and what the hazards associated with the equipment are in specific terms, do NOT handle the equipment. The greatest protection you can have when dealing with high voltage equipment is specific detailed knowledge on that particular piece of equipment.
- Avoid "haywire" test setups. It is easy to get in trouble if the setup you are using has a jumble of wires.
- Make sure your connections are secure. Do NOT allow leads to slip off and move about in an uncontrolled fashion. Even if it is not one of the high voltage leads, a free lead could (and generally does) move exactly to where you do not want it. The only safe connection is a mechanically secure one.
- Watch out for un-terminated high voltage leads. Some connectors depend on circuit loading to avoid arcing between closely spaced terminals. Unloaded high voltage lines or plugs can lead to arcing situations.
- Shut off the high voltage when you are making low voltage measurements. It does not make sense to increase danger needlessly. While there may be times when you cannot shut off the high voltage during a low voltage measurement, this is generally not the case.
- Remove the test equipment when you have finished a measurement program. There have been many instruments destroyed or damaged because a test program was conducted in a haphazard manner, rather than in an orderly progression from start to finish. Experience has shown in many instances when a little order would have prevented a tragedy or avoided an expensive mistake.
- When troubleshooting a unit, assume that the switches and components are defective. You may shut off the high-voltage switch in some systems, but if the switch were defective, the high voltage would still be on. Returned units are potential booby traps.





## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

- Make sure that your workstation is stable. Flimsy work surfaces or supports for the equipment or the test instruments represent a real threat. Do NOT use a setup that you know is unstable and/or dangerous.
- Use a 1-minute rule. Wait 1 minute or more after you have shut off the equipment before you work on a unit. Part of the reason for a 1-minute rule is that some of the dielectrics (insulators) used for high voltage circuits can store a charge. While the amount of charge stored is a function of the size of the object, a 1-minute rule provides an additional margin of safety.
- Maintain a healthy respect for any kind of live circuit. Complacency can hurt or kill you. Your continued wariness is your best insurance against injury or death.

### **MICROWAVE RADIATION**

7. This guideline presents operating practices appropriate for operators and technicians who work with equipment involving microwave radiation. Keep in mind that levels of microwave radiation that do not induce immediate physical discomfort in most individuals can be sufficiently high to induce long term effects.

8. This equipment usually related to amplification of a RF signal from an external source. Even if a source is not connected to the amplifier you are working with, there are situations where the amplifier can go into a self-induced mode and generate high levels of RF energy. This condition can exist if the unit is operated with high voltage ON and without proper termination on the input and output of the amplifier.

**ELECTRICAL HAZARD! PROTECT YOURSELF AND THOSE AROUND YOU FROM UNWANTED RF EXPOSURE. ALWAYS TERMINATE THE AMPLIFIER INPUT AND OUTPUT WITH A RF DUMMY LOAD BEFORE YOU TURN THE HIGH VOLTAGE ON. THIS WILL REDUCE THE CHANCES OF OSCILLATION DUE TO INTERNAL AMPLIFIER NOISE.**

Microwave Discussion

9. Limit exposure to microwave radiation to prevent unwanted biological effects. There are other effects that can lead to problems if you are careless in operating or servicing microwave equipment. The permissible levels are quite low in



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

comparison to the power levels of the amplifiers built by CPI (e.g., less than 10 milliwatts vs. 1,000,000 Watts delivered)

10. Local radiation levels can be detected with the proper equipment. The permissible levels are currently being studied by a number of organizations. In the past the U.S. Safety Codes established a dosage rate of 10mw/cm. sq. Recently the permissible level has been reduced to 1mw/cm. sq. in the United States, as has been the case in several European countries.

### General Microwave Guidelines

11. The purpose of these guidelines is to provide practical approaches to control unwanted microwave energy associated with the operation and servicing of this equipment.

12. The following approaches are effective in both laboratory or field environments:

- Always terminate the output waveguide or coaxial connector with a dummy RF load (capable of dissipating full CW RF power). Similarly, terminate the input to avoid the possibility of the amplifier being driven by stray leakage signals.
- Incorporate the terminations prior to applying prime power to the amplifier. This procedure prevents self-oscillation and irradiation of the local equipment.
- Do not look into the output port of the powered RF amplifier. Treat the powered amplifier as though it is a loaded gun. Your eyes are particularly vulnerable parts of your body.
- Shut off the unit if you are trying to locate a RF leak. As noted earlier, the levels of concern are very low. Examine the physical unit with the high voltage OFF. If you have to survey the RF runs with the power ON to find the leaky joint or component, start by testing the system with low RF input and a radiation meter. (d) If the microwave radiation exceeds 0.5mw/cm. sq., shut OFF the high power voltage and consult your supervisor. Work quickly (not at a panic pace) to minimize the dose level. The dose you get is directly proportional to the power level and the time you are exposed. Exposure to microwave radiation can induce both thermal and non-thermal biological effects, especially with the eyes. If you damage the lens of your



## Fault Diagnosis Manual (FDM– 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

eyes by exposure to microwave radiation, cataracts can result. Consider that small microwave ovens are very effective in cooking foods. If you follow these guidelines you can minimize exposure of yourself and other people in the operations that you control.

### **PHYSICAL SAFETY**

#### **Lifting Heavy Objects**

13. Back and other injuries can result from one person trying to lift too much weight.

14. Use extreme caution when lifting the Power Supply Assembly. Each of assemblies alone weighs 22 kg -102 kg and most of the assembly requires two persons to lift them. (and / or a lifting hoist) 15. Due to the weight of the assembly, more than two persons are required for installation of the final assembly. At least two people are also required to install the Klystron tube in the oil tank.

#### **Falling Object and Sharp Corners**

16. Serious injuries can result from heavily loaded racks or drawers falling forward. 17. Due to the weight of the subassemblies, the rack must be securely bolted to the floor in all four corners to prevent tipping. 18. Verify that all slides are securely mounted and that all latches and stops are functioning properly. 19. Serious injuries can also result from hands, fingers, or clothing getting caught when subassemblies are being pushed back into a rack. 20. Exercise extreme caution when installing subassemblies back into a rack.

#### **X-Ray Generation**

21. High Voltage Klystron's can produce X-Ray radiation. This equipment has been tested and certified that no dangerous level of X-Ray radiation is measurable outside of the Klystron assemblies. The X-Ray shield will contain any X-Rays that can be produced. Do not operate the unit with the shields removed to ensure that any X-Rays that may be produced are contained.

#### **BERYLLIUM OXIDE**

Hazardous Material



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

22. Beryllium Oxide is contained in the Klystron; it is part of the internal structure. Do NOT physically break apart any portion of the Klystron nor dispose of it. The Klystron should be returned to CPI intact for proper disposal. There is no danger of exposure to Beryllium Oxide if the Klystron is handled correctly.

## Chapter 1

### SERVO PROBLEM

List of error displayed on servo amplifier

- F02\* - overvoltage in DC bus link limit depends on the mains supply voltage
- F04 - feedback cable break, short circuit, short to ground
- F05\* - under voltage in DC bus link limit is set by manufacturer to 100V
- F06 - motor temperature too high limit is set by manufacturer to 145°C (293°F)
- F08\* - over speed motor running away, speed is too high
- F11 - brake cable break, short circuit, short to ground
- F12 - motor phase motor phase missing (cable break or similar)
- F13\* - internal temperature internal temperature too high
- F14 - output stage fault in the output stage
- F15 - I<sup>2</sup>t max. Value exceeded
- F16\* - supply - BTB/RTO 2 or 3 phases missing in the supply feed
- F19\* - supply phase is missing
- n01 - I<sup>2</sup>t threshold exceeded

1) **Description of problem** : F16/F05 error shown in the Servo Amplifier. This problem happen due to antenna hit limit switch & 400 power supply cut off from motor

**Solution** : Break release



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

### **Case 1: when antenna hit limit switch & stopped**

- Give stop command from (RSP exit) RC work station.
- Switch off servo system as per standard procedure.
  - Disable AZ & EL switches on servo unit.
  - Put 400v Breaker in off position wait for 10 second.
  - Put 230v Breaker in off position wait for 10 second.
- Now put servo unit in local mode.
- Put 230v Breaker in on position wait till servo amplifier display 20.
  
- Put 400v Breaker in on position wait for 10 second.
- Give break release command from entry pad (press BRK REL).
- Now observed P20 on servo amplifier display.
- Now make EL switch enable , Antenna will move upward
- Disable EL switch before antenna reach 50 degree.
- Switch off servo unit as per standard procedure.
- Now wait for 10 sec and then switch on servo system as per standard procedure.
- Enable EL switch and observe antenna position display.
- Antenna must move toward 5 degree, wait till antenna stable at 5 degree.
- Now enable AZ switch & observe antenna position display.
- Put servo unit in remote mode
- Restart GSP unit also
- Send volume header once RSP link is ok

### **Case 2: when antenna hit limit switch & hit ground level (BRK REL was not working)**



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**



Since antenna hit ground level or struck on pedestal. In this case external 24 dc supply should use in elevation servo motor to release the relay control of servo motor, so that antenna can move manually upward direction. Now you can follow the steps of case 1

**Case 3:** Tried BRK REL from command pad and local mode and moving up the antenna manually. But antenna seems stuck at 34.6 deg . For F05, F12, F16 error, we need to check the continuity between elevation encoder and elevation amplifier. For that check

continuity and resistance between pin No:1 in the IC No. U14 in PS & Control unit with Analog - (fourth pin) in the elevation amplifier. It should show continuity and resistance of 0.3 ohm. And w r t analog + (5<sup>th</sup> pin) the first pin U 14 IC should show large resistance of 21 k ohm. Same should be in AZ encoder & HZ amplifier combination with polarity change. BEL visited and checked Servo and changed wiring from encoder to amplifier. Changed defective flexible waveguide near feed horn. Normal scanning resumed & Servo software also upgraded.

2) **Description of problem** : AZ Servo Amplifier showing F30/ F14 error

**Solution** : After inspection it's found Sparking in AZ amplifier, burning smell from amplifier, Resistance of AZ Servo motor coil R-N, B-N&Y-N is infinite while EL Servo motor coil R-N, B-N&Y-N is 0.4 ohm, IGBT inside the servo amplifier burnt. This



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

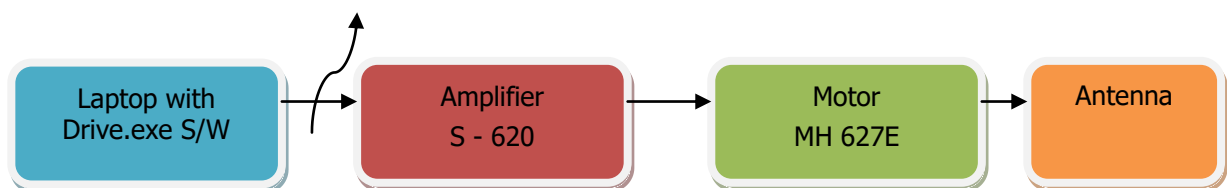
**MASTER COPY**

problem is solved after replacing the IGBT card. After that servo amplifier setting done through Servo X Software as shown in snapshots

Step to access Servo Amplifier Settings

### General Setup Diagram

RS232 cross  
cable



### Test Procedure:

1. Switch ON the 230V and 400V MCBs. Do not enable the Amplifier (Azimuth, Elevation). “Enable switches”, which are fixed on Azimuth Sub-Rack.
2. Connect the RS 232 cable between amplifier required to be tuned at connector X6 and Laptop.
3. Double click on the Drive.exe S/W. Ensure S/W connected to Amplifier by clicking on ‘Connect’ label.
4. Ensure following common settings for both Azimuth and Elevation are set in Amplifiers.
  - a. Analog I/O settings



# Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

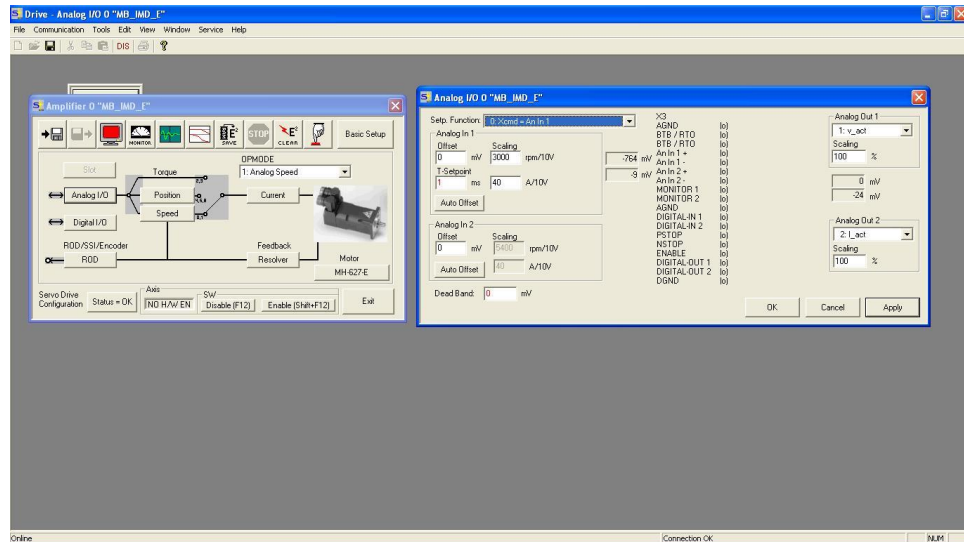
APPROVED BY:DDGM

ISSUE NO.1

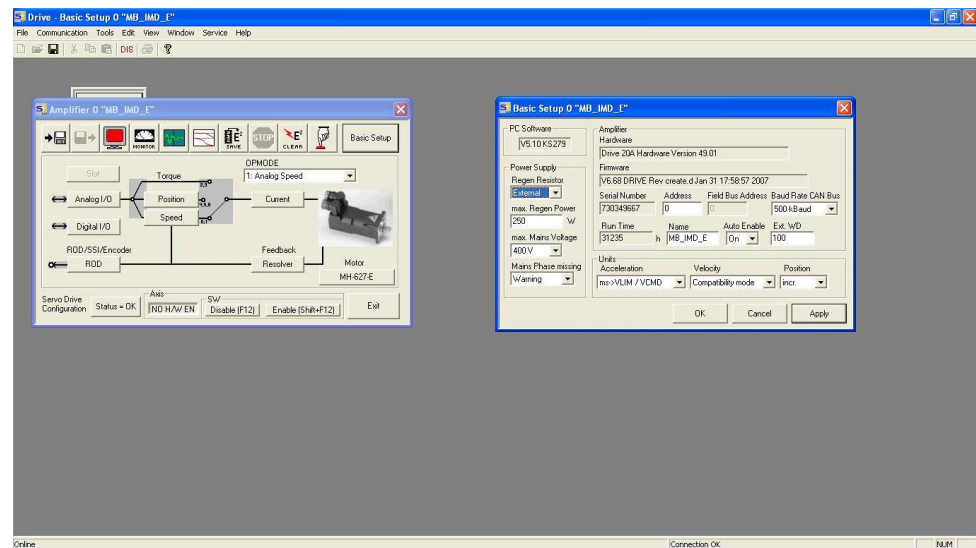
REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**



b. Basic setup



c. Motor settings





# Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

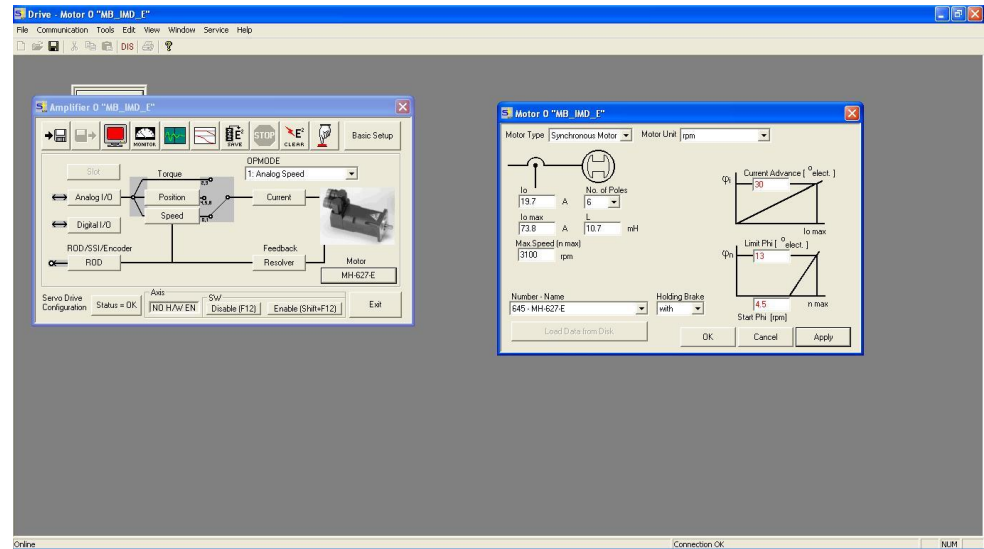
APPROVED BY:DDGM

ISSUE NO.1

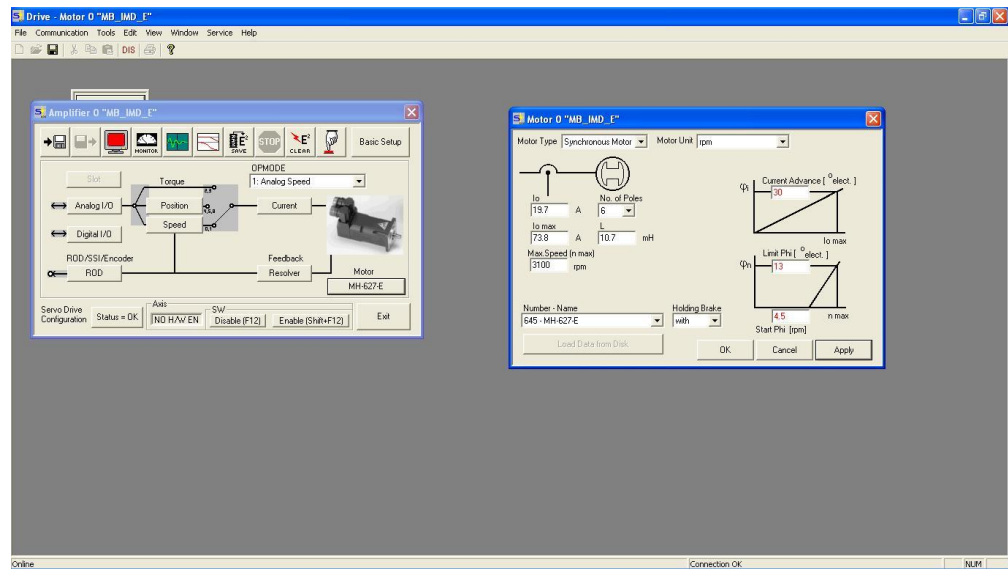
REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**



## d. Resolver settings



## e. Encoder settings



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

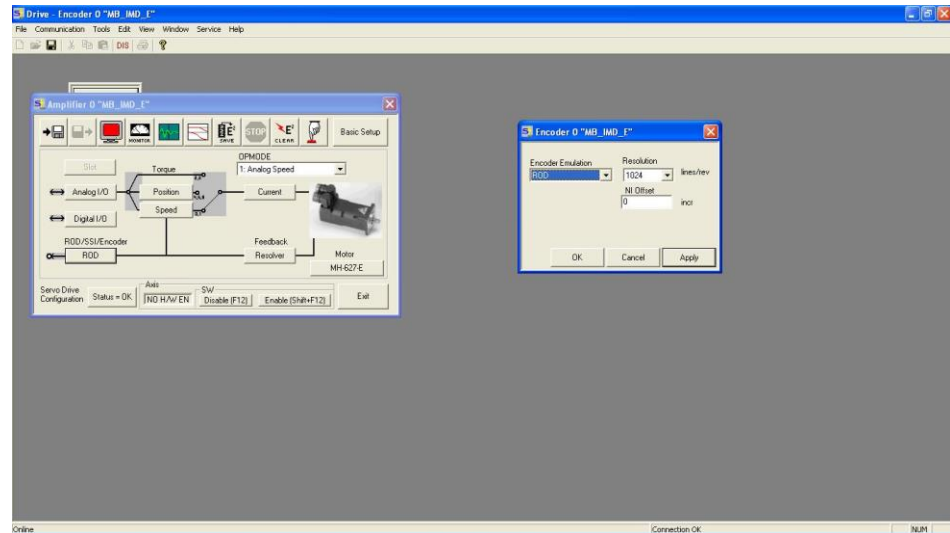
APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**



5. Tuning of the Amplifier has to be done in 2 levels. **One at current loop and other at Velocity loop.**

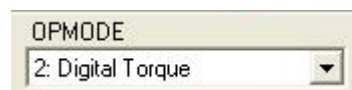
### 6. Current tuning

Two tests to be conducted, to tune the current loop.

- i. Checking the balancing of the Antenna in the axis
  - ii. Tuning the Current parameters (Kp, Tn)
- i. Checking the Antenna balance in the axis

Follow the below steps

- a. In Amplifier window, Set OPMode to Digital Torque



- b. In Amplifier window, click on Enable and ensure enabled the Amplifier.



- c. Enable the respective (Azimuth or Elevation) Switch, which is fixed on the Azimuth sub-Rack.



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

- d. Click on the Command icon in Amplifier window



- e. Click on the Status icon in Amplifier window



3) **Description of problem** : Scanning stopped because of servo F14/F08 error in Elevation amplifier.

**Solution** : F14/F08 error corresponding to error code fault in output stage. So checked output stage of amplifier. Checked amplifier parameters using RS232 DB 9 female connector and servo star software in laptop. Checked connectivity from servo to elevation motor system by checking motor winding resistance and continuity. Motor winding resistance between U, V & W found to be 0.9 ohm. Also checked isolation with ground and checked neutral to earth voltage drop and found none. Inter change AZ & EL amplifier. Still error came on the elevation side. Removed all connection to the motor at motor side and reconnected. After that issue resolved. So suspecting connectivity issue at EL motor side. Error resolved.

4) **Description of problem**: Repeated F11 error is coming from AZ servo amplifier.

**Solution:**

**Case 1** During F11 error radiation is not stopping. The transmitter was running continuously even though AZ was not changing. Cabinet temperature inside Klystron was increasing. So the time being night operation was stopped. After restart Servo scanning resumed.

LAN connection from Servo to PS & control card was loose. That is why Servo status was not reaching ARC



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

**Case 2** Servo restart was not resolving issue. Remove J16, J17 connectors in the lower PCB of control card. The J16 connector found to be burned. Cleaned J16 and reconnected. F11 error not shown scanning resumed.

**Case 3** Initially in bottom PCB of PS & control unit, instead of J16, J17 connector direct connection from relay to connector 63 & 64 made. Later BEL removed the connections to the bottom PCB as it no longer in use.(it was used for testing purpose) and direct connection between break release from amplifier and motor are done. Then F11 error issue resolved scanning resumed

5. **Description of problem:** Scanning stopped during 0130 UTC scanning. Waiting for data message displayed on screen.

**Solution** : Restarted ARC after shutdown. Second LED gone off only after toggling of switch. After giving send VH command Servo EL angle was 0.48 deg and screen was showing Waiting for data message. Restarted Servo after tightening all connectors in back side and inside control unit. Antenna went down to -4 deg. Lifted antenna using Break Release in local mode. Scanning stopped after 0.2 deg elevation in long range. Instead of 0.2 deg servo angle started at 0.27 deg in servo display. No error shown in RC controller. Restarted Servo and RC computer. 0700 UTC scanning completed.



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

## Chapter 2

### SERVER PROBLEM

1. ) **Description of problem:** unable to mount server from any workstation.

**Solution** : Replacement of hard disk

**Case 1:** Replace defective hard disk with new hard disk of same make & model and synchronize with hard disks. Since server is configure in Raid 5 configuration so one hard disk data can be recovered with help of other hard disks.

**Case 2:** Replace all hard disk and configure with raid 5 configuration.

By default server comes with ip address as -10.10.10.10.

1. Connect the server with a Windows machine using a LAN cable.
2. Change the ip address of Windows machine as -10.10.10.1



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

3. Now go to internet explorer enter <http://10.10.10.10> in the URL and press “Enter”.
4. One window will prompt Enter  
Username as – **admin**  
Password as – **admin**
5. Then one screen will appear there change the date and time.
6. Then go to “**next**” and change the ip address as -**192.168.250.100**
7. Enter subnet -**255.255.255.0**
8. Enter default gateway – **192.168.250.1**
9. Now save the setting and reboot the server.
10. Now again change the ip address of windows machine to 192.168.250.40.
11. Got to internet explorer and type <http://192.168.250.100> in the URL and press “Enter”.
12. Now check the date and time is coming correctly or not
13. Check the version of guardian OS .it should be 5. If it is not correct then install the ver 5 of guardian OS (version 5 download from the internet). To install the OS enter <http://192.168.250.100.debug.cgi> in the URL and press “Enter”. Then enter “ramroot” Then reboot the server manually. After rebooting it will ask the path to select the new OS file .select the file and click “fresh install”. Then after installation again reboot.
14. Then check whether share is created or not .if it not there then create a new share as dwr2

**Case 3:** Work station can be used as temporary server after using steps mentioned below.

- Set IP address to PC
- Set Eth0 ⇒ IP Address : 192.168.250.100
  - Subnet Mask : 255.255.255.0
  - Default gateway : 192.168.1.1
- Go to file system
- Go to etc folder
- Open Export (In text editor ) ⇒ Type /dwr2 \*(rw,sync)



## Fault Diagnosis Manual (FDM– 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

- Save it & restart the system
- Make dwr2 folder in file system
- Copy all file to dwr2 folder ( rcdp, com, dp, java32, java64, rc\_s\_band-mumbai & simulation
- Type in terminal Chmod –R 777 /dwr2
- Now run “service nfs restart” in the terminal, This will start the nfs server service on the newly configured WS.

2.) **Description of problem:** Repeated RSP restart issue. Time difference between ARC, RC, ADP & other WS

**Solution:** Restarted GSP and scanning resumed. Time issue is due to non-availability of time server after replacing SNAP server with NAS. Issue resolved by making internet PC as time server. For making time server type the following commands in the terminal

- ❖ Sudo service ntpd stop // to stop the current ntpd//
- ❖ Service ntpd status //to get current status//
- ❖ Sudo ntpdate pool.ntp.org//to update time in the time server pc from external time server. Remember always to “stop ntpd”before updating//
- ❖ Sudo ntpd restart //to restart ntpd//
- ❖ Sudo service ntpd start //to start time server//



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

### Chapter 3

#### Workstation

**Description of problem:** Workstation operating system Crash

**Solution:**

#### LINUX Installation Procedure

1. Insert Linux 5.0 (64 bit) dvd
2. Press F9 while booting
3. Installation begin do next.....next....next
4. Select customize option, Select all software option
5. Disable firewall & SE Linux
6. Set date & time as per servo Protocol, Installation finished
7. Create dwr2 folder in file system
8. Mount the server by command Mount 192.168.250.100:/dwr2 /dwr2





## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

**Prerequisite Condition:** Qt Version 4.4.0 or more should be installed in the workstation. And for RHEL 5 and above version, OpenGL Library should be installed.

**Procedure to install OpenGL Library File:**Go to the single user mode and in the command prompt give the command

1. Reboot PC
2. When display showing message “ linux start 1...2...3..
3. Press E , it will display kernel , Press E again
4. In place off Quite\_type single & press b (boot) key
5. Init3
6. Login user name =root password = root123
7. Cd desktop
8. sh /NVIDIA\_Linux\_x86\_64\_331.20.run

# Note for this copy file from server dwr2 folder to the desktop of workstation &

### **RADAR CONTROLLER (RC) –**

1. Connect a workstation (with RHEL 5 loaded) to switch -1 (1p add -192.168.250.1) using a LAN cable.
2. Connect switch-1 to server also using LAN cable.
3. Switch on the workstation.
4. Right click on the screen and open “**terminal window**”.
5. Type the following command to mount this workstation to server
  - a. **mount 192.168.250.100:/dwr2 /dwr2** then press **Enter**
6. Now insert the CD (RC software) in cd- drive and from cd copy the folder rc.
7. Now go to computer and then file system then dwr2 (this is same share whatever created during snap server installation).
8. Now paste that **rc** folder inside dwr2.
9. Use workstation with ip address 192.168.250.5 it should be connected to server through switch-1



## Fault Diagnosis Manual (FDM– 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

10. Switch on this workstation and open **terminal** and type the mount command.
11. Now go to /dwr2/rc.
12. Inside rc right click **rc.sh** and click “**run in terminal**”.
13. RC main screen will appear, there enter username & password as **-3** then **enter**.
14. Now RC application is ready to send the volume header and other commands.

**Note** – *If some of the menus of RC are not enabled then check the settings. Go to tools/xml editor/rc/src/dwrrc/xmlfiles/rtrconfig/ipaddress.xml.inside this ipaddress.xml file check whether same ip is set for RC or not if it is different from the workstation ip then change it to the same and then save and close and reopen the application.*

### **DATA PRODUCTS (DP)-**

1. Connect a workstation (with RHEL 5 loaded) to switch -1 (1p add -192.168.250.1) using a LAN cable.
  2. Connect switch-1 to server also using LAN cable.
  3. Switch on the workstation.
  4. Right click on the screen and open “**terminal window**”.
  5. Type the following command to mount this workstation to server
    - a. **mount 192.168.250.100:/dwr2 /dwr2** then press **Enter**
  6. Now insert the CD (DP software) in cd- drive and from cd copy the folder dp.
  7. Now go to computer and then file system then dwr2 (this is same share whatever created during snap server installation).
  8. Now paste that **dp** folder inside dwr2.
- Use workstation with ip address 192.168.250.50 it should be connected to server through switch-1
  - Switch on this workstation and open **terminal** and type the mount command.
  - Now go to /dwr2/dp.
  - Inside dp right click **dp.sh** and click “**run in terminal**”.
  - DP main screen will appear, there enter username & password as –  
Username - **Administrator**  
Password - **123456** then **enter**.



## Fault Diagnosis Manual (FDM– 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

- Now DP software can be used for offline data products generation and NRT also.

### **REAL TIME (RT) APPLICATION –**

#### **DWR Installation CD contains following folders and files: -**

Application folder contains the required executable files for the project. Executable file include DWRGUI, Configuration. Other than this executable it also contains configuration files and required files to run the application.

#### **Steps of installation are as follows -**

- Put the DWR Install Disk in CD-Drive.
- Create a directory /home/DWR
- Copy DWR Folder in to /home/DWR

**Note** - use this same procedure in 3 machines (for Z, V,S).

This application has to be run in three workstations for three different base products to display (Z, V, S).

1. To run this application for Reflectivity display ,use workstation with ip as - 192.168.250.12.
2. Switch on this workstation.
3. Then open DWR folder (this is different folder not same as dwr2).
4. Double click on **RunDWRGUI.sh**.
5. Enter level as administrator and password – **dwr** then enter
6. From tool bar select view option and select relectivity
7. Same steps (step1 to step6) have to be repeated for V and S also.
8. For velocity, Workstation with ip- 192.168.250.13
9. For sigma, Workstation with ip- 192.168.250.14

**Note** - There are two type of levels are available one is user and one is Administrator for both the levels password is same but level “user” doesn’t have the permission to change or view the configuration settings. If configuration settings are required to be changed then open the application with level as Administrator only.

**Description of problem** : fault related to RC WORKSTATION



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

### Case 1: No Communication with RSP

- ❖ This may be due to communication link failure. Hence, RC is not able to send or receive packets to and from RSP.
- ❖ Suggested activity: Try typing the command ping 192.168.250.11 from a command window of the operating system. 192.168.250.11 is the IP address of the RSP. (May have to be substituted with the actual IP address of RSP if changed at a specific installation)
- ❖ If ping is not successful, then hardware connectivity is to be checked to ensure switches and Ethernet cables etc., are in place.
- ❖ If the ping is successful, then next possibility is port numbers not matching between RSP and RC. This may happen only if configuration has been altered and this should be brought to the Level III user immediately.

### Case 2: No Updates on Status Display

- ❖ This may be due to the fact that Status Headers are not received by RC. This can be effectively verified by enabling of log packets under tool and then monitoring the packets by View SH and View Packets.

### Case 3: Display Updates Show Status That Are Un-Realistic Or Alarming

- ❖ This would be normally because of the data values being so in the Status Header. The Status Header bytes can be cross-checked against the HEX display of bytes in the View SH sub-menu of Tools. The reference of interpretation is given in the RC Software User Manual Version 1.1.
- ❖ If Status Header bytes appear alright but Status Display wrong, the same has to be documented as a discrepancy (specifying the byte number, HEX value and also the Status Display value (String or numeric). This document has to be



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

submitted to the vendors for further analysis. Along with this file, a ZIP file of the folder /dwr2/rc also should be attached for detailed analysis

**Description of problem:** RT display settings

**Solution:** In WS PC `DWR_s_Band/DWR_GUI/GUIXML/cmainwindows component.xml`

Open this file then ( type 1040 value for sony & 1170 for HP PC)



**Description of problem:** Symptom is no response to actions on mouse or keyboard. Reason: Either the application hangs or the system itself hangs.

**Solution:** Corrective action: Restart the system and the application. If the problem repeats, then reload the application executable alone from the supply CD; do not disturb configuration and other files. If system does not behave in normal way, explore corrective actions on individual configuration files.

**Description of problem:** NRT mode of operation stops in between or it cannot be restarted. Reason: Data archival has stopped, index file is not updated, memory heap over flow or application or system hangs.

**Solution:** Corrective action: Ensure that data archival is active and in progress and the index file is regularly updated. If this is so, then restart the application and activate NRT operation. If the scan period is slow, do not flush the index file, but allow NRT process to clear the back log. If scan is frequent, flush the index file (discard back log) and allow NRT mode to process newly archived files. Those scan files not NRT-processed can be processed in Offline mode using the same PCF folder used for NRT. Heap memory over flow can happen if the maximum memory allocated for Java Virtual Machine is very low. In this case before the application is restarted, increase the heap memory by another 64 or 128 MB memory.



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

**Description of problem** : Time series mode of operation stops in between or it cannot be restarted Application or system hangs or heap memory overflow or PCF or scan file is corrupted or configuration file is corrupted.

**Solution:** Corrective action: Heap memory over flow can happen if the maximum memory allocated for Java Virtual Machine is very low. In this case before the application is restarted, increase the heap memory by another 64 or 128 MB memory. Edit and correct configuration file. Ensure the PCF folder and the PCFs are correct, else edit them. Re-initiate Time series mode. If case of failure again, reload the application.

Products for the failed scan files can be generated using Offline mode. NOTE: Time series product generation can be stopped by closing the terminal window in which it is running. It can be activated again manually whenever required.

### Chapter 4

#### 4 Transmitter Problems

1.) **Description of problem:** Arcing and sputtering sound from Modulator and control rack. Spark observed from modulator cards with burning smell.

**Solution:** While examining the modulator card assembly it is found that resistors and capacitor of two modulator cards have been burned. BEL replaced the modulator cards and system restored.

2.) **Description of problem:** Pressure is not holding inside waveguide. Wave guide drier is working continuously. Status display is showing Transmitter "NOT OK. Scanning stopped.



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

**Solution:** In the DWR software of industrial PC (laptop) under Transmitter status >> Waveguide Low pressure showing "NOT OK". Opened the waveguide drier and closed the inner out flow valve. Then switched ON the system. Then pressure is holding. This means leakage is outside the drier. Pressure on the gauge above the transmitter rack showing almost reading. After inspecting the wave guide assembly. Flexible waveguide (Port No 4550 434 201 60) found to be broken. This wave guide become rigid due to the application of some metal joint adhesive during installation. Repaired the broken Wave guide (WG) and RADAR operation resumed.

**3.) Description of problem:** Radar Transmitter (Tr) stand by yellow and radiate red light went OFF suddenly. Restarted Tr but Tr power is not switching ON suddenly.

**Solution:** Transmitter power distribution unit is showing error. Removed PDU cover and tightened all connections. Now restarted transmitter supply. System turned ON . scanning resumed.

**4.) Description of problem:** Transmitter stopped. Informed BEL to attend the issue. LVPS is tripping each time when the main switch is turned ON.

**Solution:** BEL engineers inspected PDU. One wire in control card inside PDU was loosely connected/broken. Many IC bases were rusted because of absence of hum seal. Cleaned all PCBs using ISOL. Radar observation started from 31.03.2018.

**5.) Description of problem:** Radar operation stopped due to Transmitter error. Small exploding sound heard from inside Transmitter rack. Even though VH is sent. Antenna was scanning but transmission was not occurring.

**Solution:** BEL attended the issue. Checked HVPS and found it is working fine. So checked the resistance across modulator card assembly. It is found that



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

resistance across the cards are very low.(11ohm). It should be around 600 k ohm. So suspected capacitor bank inside the oil tank become faulty. Removed klystron assembly, drained out silicon and removed capacitor bank. It is found that out of two sets (8 capacitor in each set), one set is faulty. So replaced the defective set with new capacitor bank. New silicon oil of (90l) poured in and klystron assembly is reassembled. Scanning resumed

**6.) Description of problem:** solenoid Power supply showing 0.3V & 0.1A readings.

**Solution:** This problem can happen due to interlock switch at different door of transmitter unit. So disable interlock switch & then solenoid Power supply will show 56V & 21A readings

**7.) Description of problem:** After 4.5 degree elevation, Transmitter is not radiating radiation. Log file showing modulator average current comes down from 2.57 to 0.5A

**Solution:** capacitor & diode in MR6 modulator is burnt completely. These parts are purchased from local market & replaced on MR6 modulator card. Then on inspection its was found that triggering voltage has not been passed to klystron. 2 card out of 20 IGBT modulator are found burnt, all card are removed cleaned properly. After that this issue is resolved now

**8.) Description of problem:** Klystron collector Temperature is not ok.

**Solution:** Klystron collector blower is not working, So Impedance of Klystron collector Blower is checked.

**Red to Yellow** : open

**Red to Blue** :1.47 kohm

**Yellow to Blue** : Open

For Comparing Impedance of other blower has been checked. Detail are

**Red to Yellow** : 211.2 ohm

**Red to Blue** : 209.8 ohm





## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

**Yellow to Blue** : 209.8 ohm

Binding of Klystron collector Blower needs to replace.so Klystron collector Blower is replaces with new blower

### Chapter 5

#### 9) GSP, ARC, Receiver & Test UNIT

**1 Description of problem:** RSP restart issue. DWELL count & DTP status NOT Ok.

**Solution:** After restarting GSP scanning resumed. Soon after BEL team attended restart issue and found some glitch in the signal from the servo (Angle interrupt signal) to the GSP. Replaced some of the connections and proper grounding made. After that RSP restart issue resolved for time being.

**2 Description of problem:** Display system showing “Waiting for data” and scanning not started.

**Solution:** Suspect communication error with ARC. Restarted ARC, while restarting second red LED from top of DDC (Right most) card should glow once and go in to off



## Fault Diagnosis Manual (FDM- 0 1)

ISSUED BY: DWR TEAM

APPROVED BY:DDGM

ISSUE NO.1

REVISION NO: 00

ISSUE DATE 01/01/2019

**MASTER COPY**

condition. If it glows continuously some error is there. So to rectify it try switching on and off suddenly once or twice the 1-0 switch of GSP rack. After that restarting issue is resolved.

### 3 Description of problem: ARC software crash

**Solution:** Install software again With following Steps

Steps to Load ARC Software (for old)

- Type Startx on the screen (desktop screen will come )
- Go to root home folder on the Desktop
- Go to Mumbai – ARC 27-08-2014-Backup-old.folder and Copy Pwron Sequence. File
- Paste this file in root's Home folder itself.

Steps to Load ARC Software (for new)

- Type Startx on the screen (desktop screen will come )
- Go to root home folder on the Desktop
- Go to Mumbai – ARC 28-08-2014-Backup latest and Copy Pwron Sequence. File
- Paste this file in root's Home folder itself.