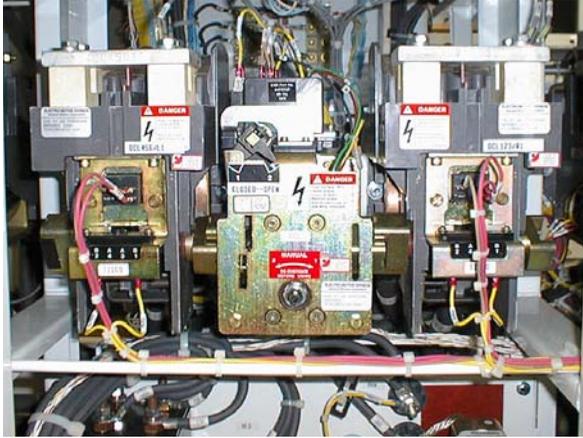




(Govt. of India)  
(Ministry of Railways)

# TROUBLE SHOOTING GUIDE ON WDP4/WDG4 LOCOMOTIVES FOR LOCO PILOTS AND MAINTENANCE STAFF



(For official use only)  
IRCAMTECH/2013/M/GM/TSG/1.0  
May, 2013

Centre  
for  
Advanced  
Maintenance  
TECHnology



Excellence in Maintenance

**MAHARAJPUR, GWALIOR – 474005**

**महाराजपुर, ग्वालियर – 474005**

**TROUBLE SHOOTING GUIDE**  
**ON**  
**WDP4/WDG4 LOCOMOTIVE**  
**FOR**  
**LOCO PILOTS AND MAINTENANCE STAFF**

## **FOREWORD**

GM locomotive was introduced in Indian Railways services in the year 1999-2000. Due to new version of locomotive, there are various differences from conventional locomotives hence proper knowledge of this technologically upgraded locomotive is necessary to Loco pilots and staff involved in operation and maintenance of these locomotives. The failure of GM Locomotives has a great impact on the reliability of the diesel locomotive. This trouble shooting guide is prepared for assistance to the staff who are involved in the maintenance and operation of WDP4/WDG4 locomotives.

This hand book contains important trouble shootings repeatedly experienced on line by the loco pilots as well as by shed maintenance staff.

I am sure that the Trouble shooting Guide will be very much useful to the concerned staff, to ensure trouble free service.

**23<sup>rd</sup> May, 2013**  
**CAMTECH, GWALIOR**

**( A R Tupe )**  
**Executive Director**

## **PREFACE**

Proper knowledge of trouble shooting of faults in GM locomotive is necessary to ensure reliability and availability of locomotives. This handbook on WDP4/WDG4 GM locomotives has been prepared by CAMTECH with the objective that those involved in operation and maintenance of diesel electric locomotives, must be aware of sufficient knowledge of trouble shootings.

Technological Up gradation and learning is a continuous process. Hence feel free to write to us for any addition / modifications or in case you have any suggestion to improve the handbook. Your contribution in this direction shall be highly appreciated.

**23<sup>rd</sup> May, 2013**  
**CAMTECH GWALIOR**

**(K.P.Yadav)**  
**Director/Mech**



## CONTENTS

Sr. No.	Description	Page No.
	<b>Foreword</b>	<b>i</b>
	<b>Preface</b>	<b>ii</b>
	<b>Contents</b>	<b>iii</b>
	<b>Correction Slips issued</b>	<b>iv</b>
<b>A-</b>	<b>CHAPTER 1</b> <b>Introduction of the GM Locomotive</b>	<b>1</b>
<b>1.0</b>	Description of Locomotive computer Display Panel	<b>2</b>
	i. Display Panel Keypad	<b>3</b>
	ii. Display Panel Screen	<b>4</b>
	iii. Navigating the Menus	<b>5</b>
	iv. Computer Display Operation	<b>5-6</b>
	v. Display Power Up	<b>6</b>
	vi. Crew Messages	<b>7-8</b>
	vii. Main Menu	<b>8-9</b>
	viii. Traction Inverter Cutout	<b>10-11</b>
	ix. Cutting-out or Cutting-In a Traction Inverter or Bogie (Truck)	<b>11-12</b>
	x. Maintenance Menu	<b>13</b>
	xi. Meter Menu	<b>13</b>
	xii. Blanking the Screen	<b>14</b>
<b>1.1</b>	List of the important Crew messages with Code.	<b>15-16</b>
<b>1.2</b>	Indicator Light Messages	<b>16-19</b>
<b>1.3</b>	Checking of the Loco by loco Pilots	<b>20</b>
<b>B-</b>	<b>CHAPTER 2</b> <b>Trouble Shooting of faults on WDP4/ WDG4 HHP Locomotives.</b>	<b>21</b>
<b>2.0</b>	Engine Shuts Down Automatically.	<b>21-23</b>
<b>2.1</b>	Reduced Power/ power not coming as per Notch.	<b>23-25</b>
<b>2.2</b>	Tractive effort meter not responding (Load meter is not responding).	<b>25-26</b>

<b>Sr. No.</b>	<b>Description</b>	<b>Page No.</b>
<b>2.3</b>	Ground Relay Tripping	<b>27</b>
<b>2.4</b>	TCC related problems	<b>27-28</b>
<b>2.5</b>	Locked wheel speed sensor fault	<b>28</b>
<b>2.6</b>	TCC Blower contactor problem	<b>28-29</b>
<b>2.7</b>	Experiencing jerks in under trucks	<b>29-30</b>
<b>2.8</b>	Digital input system failure	<b>30-31</b>
<b>2.9</b>	Air brake system problems	<b>31-32</b>
<b>2.10</b>	MR pressure dropping on Run	<b>32-33</b>
<b>2.11</b>	Simultaneous Forward / Reverse request	<b>33-34</b>
<b>2.12</b>	Simultaneously power / DB request	<b>34</b>
<b>2.13</b>	Head light not working	<b>34-35</b>
<b>2.14</b>	Flasher light not working.	<b>35</b>
<b>2.15</b>	Flasher light working continuously	<b>35</b>
<b>2.16</b>	White smoke in exhaust	<b>35</b>
<b>2.17</b>	Water level reducing	<b>35</b>
<b>2.18</b>	Engine is not cranking	<b>36-37</b>
<b>2.19</b>	Throttle not responding	<b>37</b>
<b>2.20</b>	Engine cranking but not starting	<b>37-38</b>
<b>2.21</b>	PCS Knocking off	<b>38</b>
<b>2.22</b>	Continuous wheel slip	<b>38-39</b>
<b>2.23</b>	<b><i>Air Brake Trouble Shooting</i></b>	<b>39</b>
	1.0 MR pressure dropping	<b>39</b>
	2.0 Unusual sound from compressor	<b>39</b>
	3.0 Improper loading and unloading of air compressor	<b>39-40</b>
	4.0 BP dropping and PCS Knocking out	<b>40</b>
	5.0 Air brake failure with crew message. Air brake failure- use loco in trail only.	<b>41</b>
<b>2.24</b>	<b><i>Air Brake System - Trouble Shooting in Ghat</i></b>	<b>41</b>
	1.0 MR pressure dropping with EM-2000 – Crew message “Low Main Reservoir Equalizing Pressure use Loco in trail only” FC 2977 in lead working loco.	<b>41</b>

<b>Sr. No.</b>	<b>Description</b>	<b>Page No.</b>
	2.0 If MR pressure dropping other than Leading Loco	<b>41</b>
	3.0 BC EQ – Hose pipe burst causing MR pressure dropping	<b>42</b>
	4.0 “Air brake failure use Locomotive in Trail only” FC 2975 in Lead / HLPR loco if experienced with BP leaking.	<b>42</b>
	5.0 Air brake failure other than lead / HLPR modes locos in MU's (or) TLC.	<b>42</b>
	6.0 Air brake failure in the MU / HLPR mode loco (down the ghat) (or) TLC (up the Ghat).	<b>42</b>
	7.0 Air brake penalty not getting reset even after keeping auto brake handle 10 seconds in FS or 60 seconds in emergency position.	<b>42-43</b>
	8.0 At any situation 2 control stands in one MU consists the L/T switch should not be kept in LEAD/ HLPR Mode.	<b>43</b>
	9.0 To make Lead mode MU consists to couple with another MU consist any one control stand to be kept in HLPR Mode only.	<b>43</b>
<b>2.25</b>	Important DO's and DON'T's for Loco Pilots & Shed maintenance staff.	<b>43-44</b>
<b>C-</b>	<b>CHAPTER – 3 Trouble Shooting by shed maintenance staff</b>	<b>45</b>
<b>3.0</b>	Ground Relay	<b>45-46</b>
<b>3.1</b>	Ground relay dynamic brake, Load test	<b>46-47</b>
<b>3.2</b>	No dynamic brake (OR) Load Test, Grid resistance path-1 (OR) 2 are too low	<b>47</b>
<b>3.3</b>	No dynamic brake (OR) Load test – Grid resistance path1 (OR) 2 is too high	<b>47-48</b>
<b>3.4</b>	Locked wheel (OR) speed sensor fault	<b>48-49</b>
<b>3.5</b>	Speed sensor disabling procedure	<b>49</b>
<b>3.6</b>	Cutting out of Trucks	<b>49</b>
<b>3.7</b>	Computer turn off or Reset while Reverser is not centered (OR) computer is loading	<b>49-50</b>

<b>Sr. No.</b>	<b>Description</b>	<b>Page No.</b>
<b>3.8</b>	TCC # GTO power supply under voltage or no Aux. Gen. Output.	<b>50-51</b>
<b>3.9</b>	No Companion Alternator Output	<b>51</b>
<b>3.10</b>	DC link under voltage problems	<b>51-52</b>
<b>3.11</b>	DC link over voltage Faults	<b>52</b>
<b>3.12</b>	Excitation test Failing	<b>52-53</b>
<b>3.13</b>	Low horsepower problems	<b>53</b>
<b>3.14</b>	Automatic Shutting down of the Locomotive	<b>53</b>
<b>3.15</b>	Engine speed Failure	<b>53-54</b>
<b>3.16</b>	TCC # 1 or 2 communication link failure	<b>54</b>
<b>3.17</b>	Procedure for recycling of circuit breaker	<b>54-55</b>
<b>3.18</b>	Communication Link Failure – MAB	<b>55</b>
<b>3.19</b>	Load meter not responding	<b>55-56</b>
<b>3.20</b>	Load meter fluctuations	<b>56</b>
<b>3.21</b>	Load meter not responding beyond first Notch	<b>57</b>
<b>3.22</b>	Experiencing jerks from Trucks	<b>57</b>
<b>3.23</b>	Head Light problems	<b>58</b>
<b>3.24</b>	Digital input system Failure	<b>58</b>
<b>3.25</b>	Flasher light not working or continuously working	<b>58</b>
<b>3.26</b>	Engine not Cranking	<b>59</b>
<b>3.27</b>	Filter Blower Motor breaker is not closed	<b>59-60</b>
<b>3.28</b>	Fuel pump motor breaker is tripping	<b>60</b>
<b>3.29</b>	No Grid Blower Motor current or Grid Blower Motor current is too high	<b>60</b>
<b>3.30</b>	Radiator fan Motor not working	<b>60-61</b>
<b>3.31</b>	Fuel Pump motor is not working	<b>61</b>
<b>3.32</b>	Turbo Lube pump motor is not working	<b>61</b>
<b>3.33</b>	DCOP failed to pickup / DCCL failed to drop out	<b>61-62</b>
<b>3.34</b>	Battery charging Ammeter showing discharge side	<b>62</b>
<b>3.35</b>	TCC # failed to acknowledge direction request	<b>62</b>
<b>3.36</b>	Horn continuously working	<b>62</b>
<b>3.37</b>	Event recorder communication failure	<b>63</b>

<b>Sr. No.</b>	<b>Description</b>	<b>Page No.</b>
<b>3.38</b>	TCC computer or TCC blower circuit breaker not closed	<b>63</b>
<b>3.39</b>	TCC blower contactor failed to pick up	<b>63</b>
<b>3.40</b>	Air dryer malfunctioning	<b>63-64</b>
<b>3.41</b>	Water level reducing	<b>64</b>
<b>3.42</b>	Water Siphoned out	<b>64</b>
<b>3.43</b>	Unusual sound from turbo end	<b>64</b>
<b>3.44</b>	Low compression pressure in cylinder	<b>65</b>
<b>3.45</b>	LR not matching	<b>65</b>
<b>3.46</b>	LLOB Tripping	<b>65-66</b>
<b>3.47</b>	Pinching of Lash Adjuster	<b>66</b>
<b>3.48</b>	Smoke from top Deck	<b>66</b>
<b>3.49</b>	Less CC Vacuum	<b>66</b>
<b>3.50</b>	More CC Vacuum	<b>67</b>
<b>3.51</b>	Engine shutdown Automatically	<b>67</b>
<b>3.52</b>	Piston Crack	<b>67</b>
<b>3.53</b>	Black thick Smoke from Turbo	<b>67-68</b>
<b>3.54</b>	OSTA Tripping	<b>68</b>
<b>3.55</b>	OSTA not Tripping	<b>68</b>
<b>3.56</b>	OSTA not Re-setting	<b>68</b>
<b>3.57</b>	Fuel Header vibration	<b>68</b>
<b>3.58</b>	High Lube oil consumption	<b>69</b>
<b>3.59</b>	Lube oil leakage from Air box drain pipe	<b>69</b>
<b>3.60</b>	Water leakage from Air box drain pipe	<b>69</b>
<b>3.61</b>	Oil throw from Turbo	<b>69</b>
<b>3.62</b>	Water throw from Turbo	<b>69</b>
<b>3.63</b>	Crank shaft not Rotating	<b>70</b>
<b>3.64</b>	Loss of Horse power	<b>70</b>
<b>3.65</b>	Engine Hutting in load test – 2 condition and rack length above 0.82	<b>70</b>
<b>3.66</b>	Engine is cranking in cold condition, but engine RPM is less and not holding	<b>70-71</b>
<b>3.67</b>	LR% is not matching in higher notches	<b>71</b>

<b>Sr. No.</b>	<b>Description</b>	<b>Page No.</b>
<b>3.68</b>	Abrupt increase in engine speed before getting stabilized as and when engine is notched up/down	<b>71</b>
<b>3.69</b>	If the LR% is less in all Notches	<b>71</b>
<b>3.70</b>	RPM dropping in Load	<b>72</b>
<b>3.71</b>	Bubbles at returns sight glass	<b>72</b>
<b>3.72</b>	Bubbles at 8 <sup>th</sup> notch only in return sight glass	<b>72</b>
<b>3.73</b>	Bubbles at return right glass after 3 <sup>rd</sup> or 4 <sup>th</sup> notch	<b>72</b>
<b>3.74</b>	MR pressure dropping on Run & PCS Opening	<b>73</b>
<b>3.75</b>	MR pressure dropping	<b>73-75</b>
<b>3.76</b>	Brake pipe (BP) pressure not creating	<b>75-76</b>

## A- CHAPTER – 1

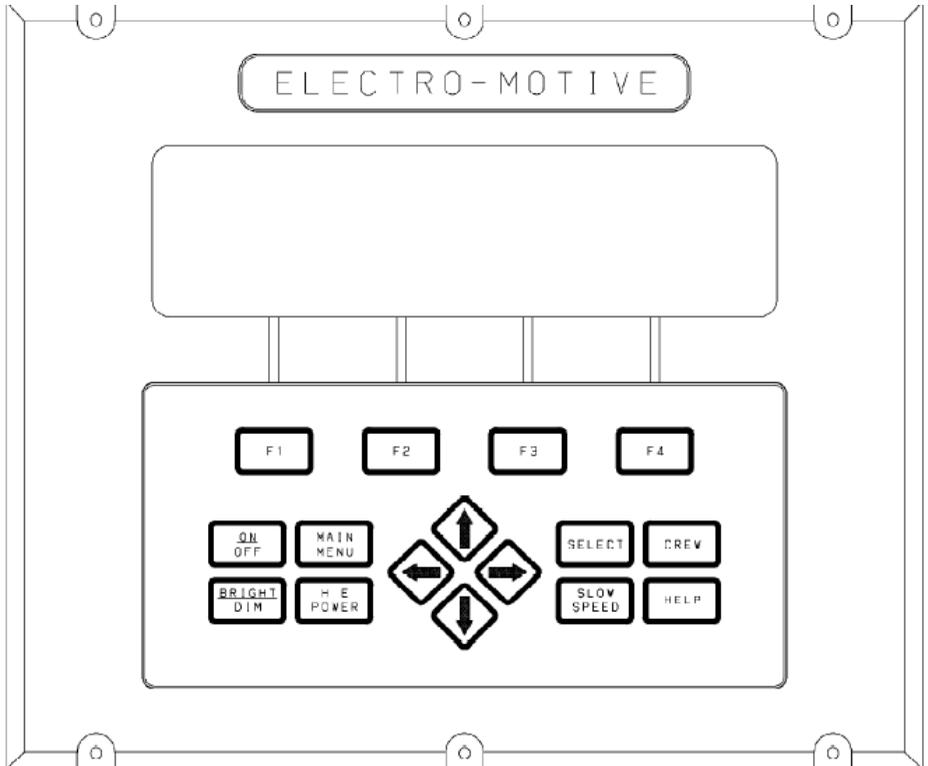
### INTRODUCTION OF THE GM LOCOMOTIVE

The WDG<sub>4</sub> & WDP<sub>4</sub> series of DLW make locomotives are GM (General Motor) locomotives. GM locomotive models are GT46 MAC for goods service and GT46 PAC for passenger service. GM locomotive is fitted with engine model No. 710G3B.

The GM locomotives are also fitted with equipments like Engine, Turbo super charger, Compressor, Alternator, Traction motors etc. like those in ALCO locomotive but their designs are different. GM locomotive are provided with Fuel oil system, Lube oil system, Cooling water system, Charged air system, Compressed air system, Air brake system, Electrical system and various safety devices like those provided in ALCO locomotive but their designs are different. GM locomotive power pack is 16 cylinders, Two strokes, 'V'-arrangement, internal combustion engine. GM locomotive is highly fuel efficient having 11% better fuel efficiency compared to the ALCO design locomotive. GM locomotive is a 4000 BHP locomotive. GM locomotive is having highly improved maintainability compared to ALCO locomotive. This locomotive is equipped with a microprocessor based computer control system- referred to as EM- 2000 locomotive computer.

## 1.0. DESCRIPTION OF LOCOMOTIVE COMPUTER DISPLAY PANEL

The locomotive computer display panel, consists of a 6-line, 40-column vacuum fluorescent display with a 16-key back-lit keypad.



**Figure 1.0 – Computer Display Panel  
Panel with key pad:**

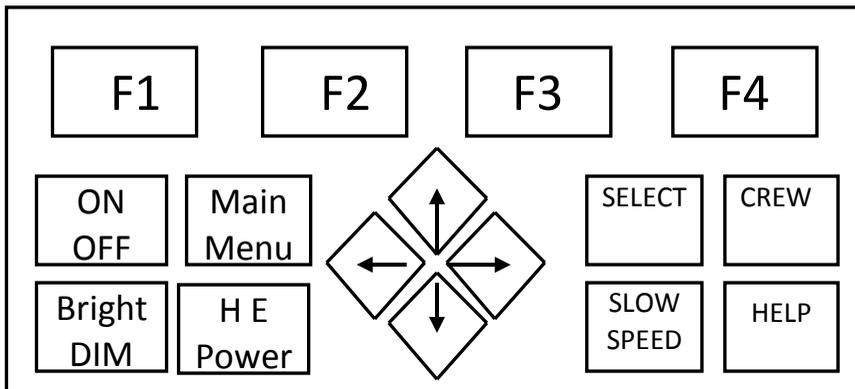
This display panel is an interactive device that is an interface between the locomotive computer (EM2000) and the locomotive operating crew. The crew can read the display and input information to EM-2000 through the keypad. EM-2000 messages further instruct the crew.

## i. Display Panel Keypad

The locomotive computer display panel is equipped with a keypad. The keys are:

- **F1, F2, F3, F4 Keys** are function keys. The functions may vary on each screen. Pressing a function key typically requests the loco computer to perform a function- reset a fault, cut out an inverter, display stored data, etc.

The function keys are directly below the display screen. The bottom line on the screen names the function that each function key can perform. If no function appears above a function key, it has no function on that screen.

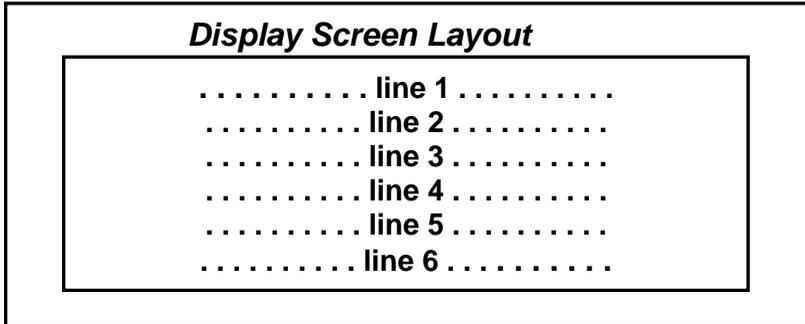


**Figure 1.1 – Display Panel key pad**

- **ON / OFF Key** controls display panel operating power.
- **MAIN MENU Key** returns screen to main menu.
- **BRIGHT/DIM Key** controls screen intensity.
- **HE POWER Key** Not used.
- **Arrow Keys** (↑, →, ↓, ←) move the screen cursor.
- **SELECT Key** selects the item at the cursor location.
  - **CREW Key** returns screen to crew messages display.
  - **SLOW SPEED Key** Not used.
  - **HELP Key** Not used.

## ii. Display Panel Screen:

The display screen has 06 horizontal lines which are designated for reference as shown below.



There are three major locomotive computer display screen classifications:

- **Crew Message Screens** replace annunciator module and local engine indicator lights used on previous model locos.

**Note:** Crew Messages describe normal operating conditions and various locomotive problems.

Examples of conditions and problems described by crew messages:

- Engine speeds-up because water temperature is too low.
- Locomotive is not properly set up for the requested mode of operation.
- Traction power is being limited for some reason.
- Some locomotive equipment or system has failed, and a protective function is active.
- **Menu Screens** offer choices such as various service functions routinely performed by the operating crew: fault reset, system cut out, etc.
- **Blank Screens** reduce annoying screen illumination when screen is not in use.

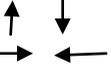
### iii. Navigating the Menus:

The locomotive computer display has a cursor-driven menu system.

The cursor consists of two inward-pointing arrowheads:



Menu items appear between the two cursor arrowheads, in the “. . . . .” space shown above.

Move the cursor with the keypad arrow keys:  Press the  key to move the cursor from the bottom of one column to the top of the column to the right.

To select a menu item, move the on-screen cursor to the item, then press the SELECT function key. Selecting one menu item causes a sub-menu to appear on the display. To activate certain menu items, it is necessary to press a function key, such as CUT OUT.

### iv. COMPUTER DISPLAY OPERATION

The locomotive computer display performs both loco operation and loco service functions. Loco operation functions include some service-related procedures, such as traction motor cutout and fault reset.

1. **Operation** - Loco crew members use only Crew Message screens to monitor unusual operating or fault conditions and cut out motors or reset faults.
2. **Service**- Maintenance personnel use two types of screens:
  - Crew Message screens to examine fault conditions.

- Main Menu screens to load test the locomotive, self-tests for certain locomotive systems, meter screens, and other trouble shooting data.

**Note:** The GT46PAC locomotive is equipped for traction inverter cutout. Cutting out traction inverter #1 cuts off power for both bogie #1 traction motors. Cutting out traction inverter #2 cuts off power for both bogie #2 traction motors. If a traction inverter or its blower fails, the fault causes bogie power lockout and a crew message. To continue operation, cut out the traction inverter for that bogie.

#### v. Display Power Up:

When the locomotive computer and its display panel initially power up after a shutdown, the computer displays the following on the screen:

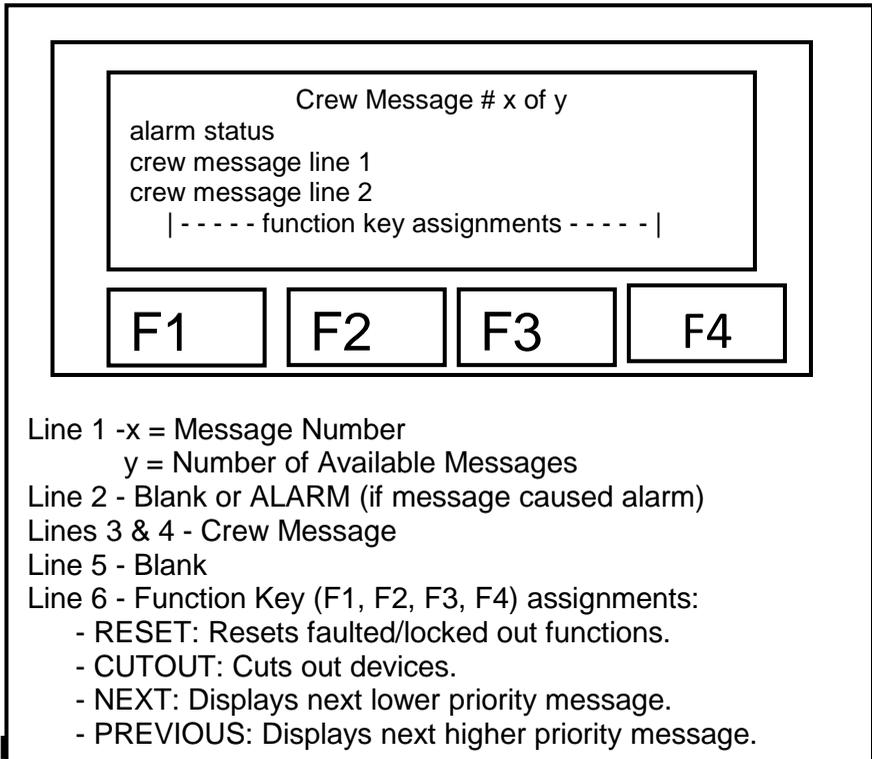
1. Fault messages that occurred since the fault annunciator was last reset are stored in locomotive computer archive memory. The “MAINTENANCE INFORMATION STORED” message appears at the top of the screen for ten seconds after power-up if there are any messages in the annunciator.
2. If there are not any stored (archived) fault messages, but there are active crew messages, then the computer will display the active crew messages on the Crew Message screen.  
**Note:** Only one message is displayed on the screen at a time.  
Each message includes a specific priority number.

EM2000 displays messages in order by priority number.

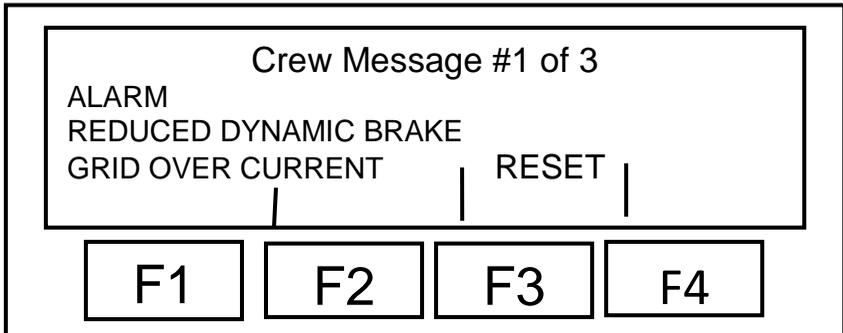
The priority numbers have been assigned based on urgency.

3. If there are no active crew messages, then the locomotive computer displays the Main Menu screen,

**vi. Crew Messages:**-The Crew Message screen, displays fault conditions that require immediate attention - important crew messages interrupt the other display functions.



Pressing function key F3, resets this fault, provided that the fault condition is not still present.



**Fig. 1.2 Typical Crew Message**

### **vii. Main Menu**

To bring up the Main Menu screen, press the MAIN MENU key once, or press the EXIT key on other screens as many times as necessary.

The Main Menu screen is the starting point for access to the EM2000 for locomotive service and service-type driver functions. Starting at the Main Menu screen, service personnel have multiple screen options available for evaluating performance, testing subsystems, and troubleshooting equipment and circuitry.

The cursor in is set at Data Meter. If the SELECT function key is pressed, the displayed screen changes to the meter menu screen,

### Main Menu Screen

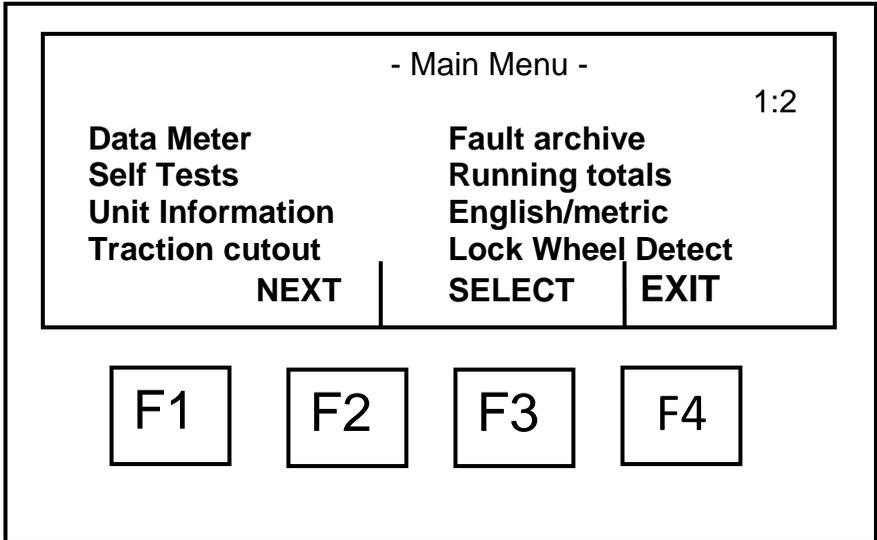


Fig. 1.3

If the NEXT function key is pressed while the Page 1 Main Menu screen displays,

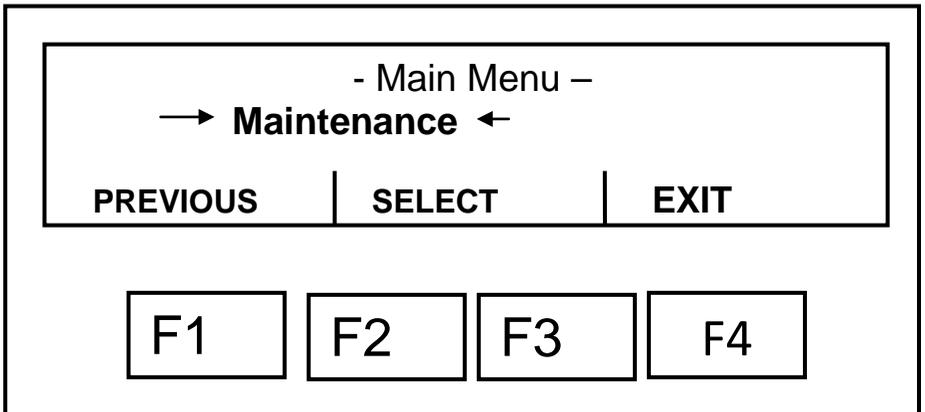
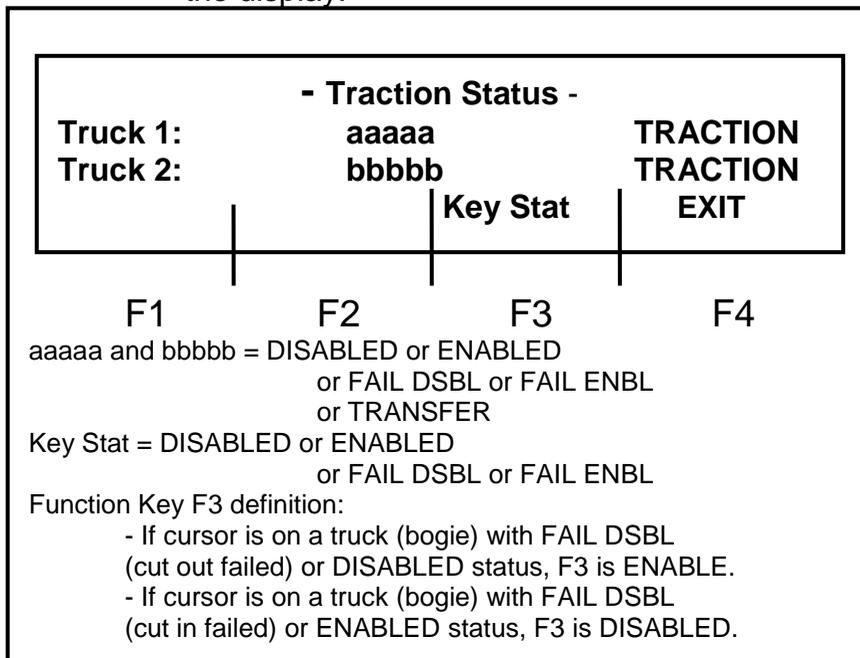


Fig. 1.4 Main Menu Screen

### viii. Traction Inverter Cutout

The traction inverter cutout function replaces the engine control panel traction motor cutout switch on previous EMD locomotive models. This function enables the locomotive crew to view the status of both traction inverters on the EM2000 display, and enables them to cut out or cut in either traction inverter with the display.

This locomotive has separate cooling air blowers for each traction inverter. If one of the blowers fail, then it is advantageous to cut out the traction inverter associated with that blower, enabling the locomotive to be powered by the other traction inverter. The entire bogie (truck) can be electrically disabled or enabled through the display.



**Figure 1.5 Truck (Bogie) Electrical Status**

Traction inverter disable/enable functions can be performed from the Traction Status display screen, Figure given above.

**Note:** The locomotive must be unloaded while attempting to disable/enable a traction inverter. Access the Traction Status screen in either of two ways -

- Select TRACTION CUT OUT on the Main Menu.
- Operate the CUTOFF function key on a Crew Message screen indicating a faulted device.

**Note:** In order to continue operation after a fault causes power lockout (crew message appears), it is necessary to disable a truck (bogie).

#### **ix. Cutting-out or Cutting-In a Traction Inverter or Bogie (Truck)**

Changes in traction status usually must be made because of a fault condition that is indicated by a crew message on the locomotive computer display. The following are traction status changes:

- Disabling a bogie (truck): all motors on a bogie and the associated blower motor are cut out.
- Enabling a bogie (truck): all motors on a bogie and the associated blower motor are cut back in.

For each fault condition, a crew message is displayed that identifies the fault and assigns it to a bogie.

A failure of the a traction inverter blower produces a crew message -

TRACTION INVERTER BLOWER #1 IS NOT TURNING, for example. If the CUT OUT key on Crew Message screen is pressed, the screen changes to the Traction Status screen, Figure given above, to enable the bogie to be cut out.

***Proceed as follows to cut out an inverter or bogie:***

1. The CUT OUT designation is above the function key on the Crew Message screen having the fault message.
2. Isolate the locomotive. (Set isolation switch in START/STOP/ISOLATE.)
  3. Press the CUT OUT function key to bring up the Traction Status screen.

**Note:** The Traction Status screen is also accessible directly from the Main Menu screen by selecting the Traction Cut Out option.

3. On the Traction Status screen the Key Stat function key (F3) is designated ENABLE or DISABLE for a faulted bogie blower. Moving the cursor to the faulty bogie causes the function key designation to indicate the status of that device.
  5. The status of the bogie (truck) displays.
4. If the cursor is at Truck 1, and bogie 1 is ENABLED, only the DISABLE and EXIT functions are available because this bogie is already enabled.
  7. Press DISABLE key to cut out the #1 bogie.
    - During cutout process, truck (bogie) status changes to TRANSFER.(No function keys are designated during cutout process.)
    - If cutout process is successful, Truck 1 (bogie 1) status changes to DISABLED on the display.

**Note:** If just interrogating computer for bogie status, be sure both bogies are cut in before operating locomotive.



## xii. Blanking the Screen

Screen blanking eliminates all screen text from the EM2000 display when it is not needed. Screen blanking actuates when either of the following conditions is true:

- OFF key on keypad is operated.
- There has been no keypad usage for the past 30 minutes provided that:
  - There are no active crew messages, and
  - No locomotive system self-test or device cut-out process is running.

To return to the previous screen after the screen has been blanked, press the ON key (on display panel keypad) no later than 10 minutes after the screen was blanked.

During locomotive operation, the display screen is blank most of the time because there are no loco fault conditions & the locomotive crew has not used the keypad for 30 minutes.

## 1.1. LIST OF THE IMPORTANT CREW MESSAGES WITH CODE

Following are some common potential crew messages.

<b>CODE</b>	<b>CREW MESSAGES</b>
241	DYNAMIC BRAKE GRID OVERCURRENT
309	ENGINE AIR FILTERS DIRTY
14	ENGINE AIR FILTERS DIRTY-THROTTLE 6 LIMIT
0	ENGINE DEAD - UNIT NOT ISOLATED
73	ENGINE DIED WHILE ISOLATED
206	ENGINE IS NOT RUNNING
322	ENGINE PROTECTION SHUTDOWN
76	ENGINE SPEED INCREASE – Turbo COOL DOWN CYCLE
77	ENGINE SPEED INCREASE - LOW AIR PRESSURE
311	ENGINE SPEED INCREASE - LOW WATER TEMPERATURE
240	ENGINE SPEED INCREASE - TRACTION MOTOR COOLING
512	FILTER BLOWER MOTOR CIRCUIT BREAKER IS OPEN
96	FORCED IDLE - ENGINE RUN SWITCH DOWN
281	FUEL PUMP IS NOT RUNNING
124	GENERATOR FIELD OVEREXCITATION
61	GROUND RELAY - DYNAMIC BRAKE
319	GROUND RELAY - POWER
302	HOT ENGINE - THROTTLE 6 LIMIT
15	#n LOCKED WHEEL
494	#n LOCKED WHEEL DETECTION DISABLED
	NO ACTIVE CREW MESSAGES
172	NO DYNAMIC BRAKE - DYNAMIC BRAKE CUTOUT
600	NO DYNAMIC BRAKE - GROUND RELAY LOCKOUT
174	NO LOAD - ENGINE TEMP FEEDBACK FAILURE
176	NO LOAD - GENERATOR FIELD SWITCH DOWN OR SDR RELAY IS PICKED UP
178	NO LOAD - GROUND RELAY CUTOUT
192	NO LOAD - IMPROPER B CONTACTOR STATUS
179	NO LOAD - IMPROPER GFC STATUS

200	NO LOAD - IMPROPER GFD STATUS
<b>CODE</b>	<b>CREW MESSAGES</b>
453	NO LOAD - NO COMPANION ALTERNATOR OUTPUT
456	NO LOAD - PCS OPEN
221	NO LOAD - SIMULTANEOUS FORWARD/ REVERSE REQUEST
131	NO LOAD - SIMULTANEOUS POWER/SLOW SPEED REQUEST
125	NO LOAD - UNIT IS ISOLATED
8	NO LOAD TEST, DYNAMIC BRAKE - EXCESSIVE GRID BLOWER #n CURRENT
4	NO LOAD TEST, DYNAMIC BRAKE - GRID BLOWER #n GRID FAILURE
2	NO LOAD TEST, DYNAMIC BRAKE - GRID CURRENT IMBALANCE
10	NO LOAD TEST, DYNAMIC BRAKE - GRID OPEN CIRCUIT
11	NO LOAD TEST, DYNAMIC BRAKE - GRID OVERCURRENT
7	NO LOAD TEST, DYNAMIC BRAKE - NO GRID BLOWER #n CURRENT
59	NO POWER - GROUND RELAY LOCKOUT
127	REDUCED DYNAMIC BRAKE - ENGINE SPEED UP FAILURE
22	REDUCED POWER, DYNAMIC BRAKE - TRACTION MOTOR BLOWER #n FAULT
130	SIMULTANEOUS POWER/DYNAMIC BRAKE REQUEST
133	STARTER MOTOR OVERLOAD
149	TRAINLINE ALARM BELL
222	TURBOCHARGER CIRCUIT BREAKER OPEN
521	TURBOCHARGER LUBE PUMP NOT RUNNING

## 1.2. INDICATOR LIGHT MESSAGES:

The control consoles each incorporate a six-indicator light assembly. Each indicator is imprinted with a word or phrase that conveys a message for the locomotive driver.

**BB C/O Light On:**

**Conditions:** Engine control panel BLENDED BRAKE switch is set in CUT OUT (slider Down). Setting AUTO brake handle in SERVICE ZONE causes air braking alone to apply - without any dynamic braking.

**Action Required:** To regain use of blended braking, set BLENDED BRAKE switch slider in CUT IN (Up).

**SAND Light On:**

**Conditions:** This light indicates locomotive sanding is active on this locomotive and on train lined locomotives for any of various reasons (SAND switch operated, automatic sanding initiated for wheel creep enhancement, etc.)

**Action Required:** None.

**WHEEL SLIP Light, Continuous or Flashing Regularly****Locked Powered Wheel Condition:**

**Note:** follow prescribed instructions concerning Locked Wheel faults.

Locomotive computer immediately lights WHEEL SLIP indicator and drops load when Siemens system detects locked wheel. After 10 seconds delay, (20 sec.if air brakes are applied), locomotive computer sets fault, sounds alarm bell, continues WHEEL SLIP light, and displays following message: #n LOCKED WHEEL - STOP TRAIN AND THEN CHECK IF THE WHEELS TURN FREELY. Fault indications above continue until driver uses loco computer display panel to reset fault.

**WARNING**

Locked wheels on moving locomotives are very dangerous. If locked wheel is indicated, do the following:

**Action Required:** Stop the train and set the throttle handle in IDLE. Then follow the procedure provided for Locked Wheel Condition.

### **WHEEL SLIP Light, Flashing Irregularly or Occasionally**

For any locomotive connected to any loco by train jumpers, the conditions given below can activate the control console WHEEL SLIP light.

**Startup/Slow Conditions:** Speed under 2.4 km/h (1.5 MPH); normal startup wheel slip correction operation.

**Action Required:** No action required. Do not reduce throttle unless slipping threatens to break the train.

**Normal Running Conditions:** Speed over 2.4 km/h (1.5 MPH); backup of Super Series wheel creep control operation. Possible failure of Super Series. May also indicate normal wheel slip detection/control on train lined non-Super Series units.

**Action Required:** No action required. Do not reduce throttle unless slipping threatens to break the train.

**Over speed Conditions:** Wheel over speed detected by computer. The indicator light flashes- 3 seconds "On"/ 3 seconds "Off" - to indicate wheel (and traction motor) over speed, and locomotive computer displays WHEEL OVER SPEED message.

Cause may be excessive track speed or simultaneous slipping of all locomotive wheels. In either case, the system automatically corrects by regulating traction alternator output (power drops out until speed drops, then picks up again). Locomotive computer message and indicator light flashing automatically cancel after recovery.

**Action Required:** Reduce throttle setting.

**FLSHR LAMP Light:**

**Conditions:** This light flashes On/Off when either outside flasher lamp (at cab end or at long hood end) is flashing, provided that outside flasher lamp is not burned out and LIGHTS breaker is closed. Flashes at same rate as outside flasher lamp.

**Action Required:** Open flasher light switch when flasher light operation is no longer required.

**PCS OPEN Light On:**

**Conditions:** Penalty or emergency brake application and loss of power. Computer displays NO LOAD - PCS OPEN message, motoring/Diesel engine will come into throttle idle however dynamic braking can be availed.

**Action Required:** Set throttle in IDLE. Set automatic brake in EM (Emergency), wait 60 seconds, then set in REL (Release). For the recovery of penalty is always gets displayed on EM 2000 screen. For example: EM 2000 displays “keep auto brake handle in full service for 10 seconds to recover normal air brake”.

**BRAKE WARN Light On:**

**Conditions:** Excessive dynamic brake current on this loco or on a train lined locomotive.

**Action Required:** Reduce dynamic brake handle setting immediately. If light stays On, set DYN BRAKE cutout switch on engine control panel in CUT OUT (slider Down). Computer then displays NO DYNAMIC BRAKE-DYNAMIC BRAKE IS CUT OUT message.

### 1.3. Checking of the Loco by Loco pilots:

1. Before starting the train, ensure good quality sand is available in all sand boxes.
2. Check water level in loco dead condition and after cranking condition.
3. Keep 10 seconds gap for power to DB and DB to power mode.
4. If loco is not cranking 2/3 times, wait to cool down the starting motors for 2-3 Minutes.
5. If required for raising the Engine, put -
  - A. Engine Run Switch to run.
  - B. Isolation switch to run.
  - C. Reverser in natural
6. Don't reverse the loco operation while in moving.
7. For enroute, if loco shut down, first secure the loco before cranking.

## B-CHAPTER – 2

### TROUBLE SHOOTING OF FAULTS ON WDP4/WDG4 HHP LOCOMOTIVES

Some of the important trouble shootings of WDG4/WDP4 locomotives are given in this chapter for assistance to loco pilots.

S No	Fault	Items to be checked	Action to be taken by Loco Pilot	
<b>2.0</b>	<b>Engine Shuts Down Automatically</b>	Check for LLOB tripping	RESET LLOB	
		Check for EPD tripping	a.If EPD found tripped, RESET button and also RESET LLOB button. b.Bottom button (crank case button) tripped, inform shed, do not try to re-crank.	
		<b>Note:</b> Whenever EPD button trips, it will always be accompanied with the tripping of LLOB button.		
		OSTA tripping	RESET OSTA	
		If OSTA tripping, LLOB & EPD may also trip. Check LLOB & EPD buttons for tripping if found trip. RESET them.		
		Check for malfunctioning of master controller	Checks throttle position in the EM 2000 display. If it shows "STOP", change control stand and work. If the problem is not rectified, check for tightness of the couplers 543A, B,C in SH control console.	

S No	Fault	Items to be checked	Action to be taken by Loco Pilot
		Check MU stop button	If found pressed, RESET it.
		<b>Note:</b> In this case, computer shall display "MU STOP REQUEST"	
		Check tightness of rack by physically moving lay shaft	If the lay shaft is not moving at all, or is tight. Try to re-crank the loco and Clear the section.
		<b>Note:</b> If rack stuck up, EM 2000 shall display the message "GTO POWER SUPPLY 1 UNDER VOLTAGE" AND "GTO POWER SUPPLY 2 UNDER VOLTAGE", "ENGINESPEED FAILURE" AND "DC LINK UNDER VOLTAGE"	
		Check for bubbles in return sight glass, i.e., fuel sight glass nearer to the engine block while priming. Also check for oil in by pass sight glass.	If return sight glass is having bubbles, tighten the spin-on-filter and strainer and re-crank the loco. If the bubbles are still present, try to clear section and ask relief loco. If by pass sight glass is full of oil & return sight glass has no oil, nothing can be done. Demand for loco.
		Check for red LED indication in PRG, PSM modules	Inform shed and seek advise
		Check for red indication in any of the EM	Inform shed and seek advise

S No	Fault	Items to be checked	Action to be taken by Loco Pilot
		2000 modules	
		Check for tripping of slide switch for fuel pump	RESET slide switch and re-crank the locomotive.
		<i>Note: if any of the above problems are noticed and engine is shutting down with speed bogging down, disconnect the AMPHENOL plug and try to re-crank, if loco is not cranked after removal of AMPHENOL plug, nothing can be done and consult shed.</i>	
2.1	<b>Reduced Power/ power not coming as per Notch</b>	Check for bubbles in return sight glass, i.e., fuel sight glass nearer to the engine	<ul style="list-style-type: none"> <li>• Ensure tightness of filter, fuel. Strainer &amp; fuel primary drain cock should be in closed condition.</li> <li>• Ensure that minimum 1500 liters of diesel is available in tank.</li> </ul>
		Check for radiator fans not working	<ul style="list-style-type: none"> <li>• RESET radiator fan breaker <i>if</i> provided.</li> <li>• Check for any visible loose connection in radiator fan circuit in ECC3.</li> <li>• Swap 010 1 and 3.</li> <li>• Radiator fan fuse might have blown, nothing can be done, work in lower notches if the train load permits, Inform Shed</li> </ul>
		<b>Note:</b> If radiator fans are not working, EM	

S No	Fault	Items to be checked	Action to be taken by Loco Pilot
		2000 shall display "REDUCED POWER – THROTTLE 6 LIMIT	
		Check for TCC over temperature	Work in lower notches if possible; else wait for a while and allow TCC temp.to come down, and then work further. If the message appears only in one TCC, that particular TCC can be isolated, if the train load permit
		Check for Traction Motor over temperature	Work in lower notches if possible; wait to cool down Traction Motors, and then start again.
		<b>Note:</b> In case of TCC over temperature and TM over temperature, message shall be logged in EM 2000 showing "REDUCED POWER TCC OVER TEMPERATURE" or REDUCED POWER HOT TRACTION MOTOR"	
		Check for throttle position in EM If EM 2000	If EM 2000 does not display the same throttle position as the actual throttle position, change the control stand and work further.
		Check for speed and power fluctuation.	Ensure tightness of AMPHENOL plug of Governor. If the problem persists, seek advice from shed.
		<b>Note:</b> Full ENG HP will not be achieved at	

S No	Fault	Items to be checked	Action to be taken by Loco Pilot
		<i>Lower speeds since load regulation is based on Tractive Effort. Full HP will be achieved at about 25 KMPH.</i>	
2.2	<b>Tractive effort meter not responding (Load meter is not responding)</b>	Check PCS knocked out	Recover PCS as per the message displayed in EM 2000
		Check for governor AMPHENOL plug tightness	Tighten the AMPHENOL plug
		Check Engine Run Switch position	Switch on the engine run switch (It should be UP)
		Check for throttle position in EM 2000 display	If TH position is not in actual throttle position, change the control stand and work further.
		Check couplers 543A. B & C tightness	Tighten the couplers in control stand.
		Check for DIO card failure (there will be no indication In EM 2000)	Swap DIO cards 1, & 3 or 2 & 3. If the problem sets right work further; else seek advice from the shed.
		Check for locked axle message in EM 2000 display	Ensure free movement of that particular axle physically. If the wheel is rotating freely, disable the speed sensor through EM 2000 and work further.
		Check for	Check AG drive shaft is

S No	Fault	Items to be checked	Action to be taken by Loco Pilot
		message "NO COMPANION ALTERNATOR OUTPUT-NO AUXILIARY GENERATOR OUTPUT"	intact. If shaft is broken, Inform Shed. DVR may be defective, nothing can be done and ask for relief locomotive & INFORM SHED.
		Check for AG field/ feedback breaker tripping in panel.	If tripped, RESET and work further.
		Check for AG circuit breaker in ECC2.	a. If tripped RESET and work further.
		Check for position of isolation switch	Keep in ON position (UP)
		Check for position of GF switch.	Put in ON Position (UP)
		Check for GF breaker	Put in ON Position (UP)
		Check for crew message	Act according to the crew message
		Check for reverser Input in power data in data meters. This will be shown "PROP" in	If OPMODE does not show PROP, change control stand

S No	Fault	Items to be checked	Action to be taken by Loco Pilot
		OPMODE'.	
2.3	<b>Ground Relay Tripping</b>	Check crew message. If it shows "GR-POWER"	Isolate TMS one by one & locate in which TM GR is tripping. TM causing GR tripping may be isolated & work further.
		If the crew message shows "GR-DB, Load Test"	Isolate DB by DB slide switch provided in engine control panel and work further.
2.4	<b>TCC related problems</b>	Check crew message. TCC internal RESET.....	It causes automatic reset of TCC & Loco Pilot need not do anything. Loco can work further without any problem.
		TCC communication link failure.	Recycle that particular TCC computer breaker along with EM 2000 computer breaker.
		TCC failed to acknowledge DB request.	
		TCC failed to acknowledge LOAD request.	
		TCC failed to acknowledge DIRECTION request.	
		TCC internal RESET-No Speed detectable	Nothing is required to be done and train will work normally.

<b>S No</b>	<b>Fault</b>	<b>Items to be checked</b>	<b>Action to be taken by Loco Pilot</b>
		TCC # lock out .....	Recycle the TCC computer breaker. If the message disappears, work further. If the message continues to appear, isolate the particular truck, if the train loads permits.
2.5	<b>Locked wheel-speed sensor fault</b>	<p>Verify free rotation of the wheel by moving loco.</p> <p>Note: If the message does not disappear even after disabling the speed sensor, dis-engage the speed sensor connector on the TM. After disabling the speed sensor computer will show "TCC# n speed sensor disabled for locked wheel detection. Ignore the message &amp; work further.</p> <p>In case for any reasons, recycling of computers is done, speed sensor becomes enabled automatically. Hence it is required to be disabled again after recycling.</p> <p>Also the speeds of Traction Motors in terms of RPM can be checked in "Speed Meter" screen in data meters. There should not be any abnormal variation.</p>	If it freely rotates, disable that particular speed sensor and work further
2.6	<b>TCC Blower contactor problem</b>	Check crew message-Reduced Load TCC#n blower	Check for tripping of TCC computer breaker or TCC blower breaker. If tripped, RESET.

<b>S No</b>	<b>Fault</b>	<b>Items to be checked</b>	<b>Action to be taken by Loco Pilot</b>
		breaker/ computer breaker is not closed.	
		If blower breaker is repeatedly tripping	Open the circuit breaker panel and by pass the feedback interlock wires (Wire Nos. MULA7 & MULAX for TCC1, MULB7 & MULBX for TCC2). The wires are to be removed from the interlock terminals and joined together & insulated. Inform shed.
		TCC#n blower contactor failed to pick up	Isolate that particular truck and work further. If the load does not permit to work on single truck, contact the shed.
2.7	<b>Experienc ing Jerks In under- truck</b>	Check for speed sensor fault on EM 2000 display	Isolate defective speed sensor duly ensuring free rotation of the wheel and work further.
		TCC- problem, indicated in EM2000 screen.	Isolate that particular truck as indicated in EM 2000 display screen & work further.
		Select creep control in data meters and check for the value of	Check for cleanliness of Radar face plate. If it is dirty clean ft. Also check for tightness and intactness of the Radar

<b>S No</b>	<b>Fault</b>	<b>Items to be checked</b>	<b>Action to be taken by Loco Pilot</b>
		N+dN during run. If it indicates 3600 on free run.	cable and plug.
		Check for proper working of sanders	If sand is not coming, check for availability of .sand in sand boxes. If is sand is available in the, boxes, close the nozzle by hand' and operate the sander manually to clear any blockage and ensure free flow of sand.
		Check for Traction Motor cables in the under gear.	If any of the cable is found cut or dis connected, disable that particular truck and work further - INFORM SHED.
		Jerk during DB.	Stop the locomotive, select DB in data meters and check uniform increase of TL24T voltage from 0 to 74. Volt, as the throttle handle is moved in DB zone from set up to 8111 notch. If it is not uniform & it suddenly increases to maximum voltage, isolate DB and work.
<b>2.8</b>	<b>Digital input system</b>	Check for crew message -	Swap DIOs 1 or 2 with 3 duly putting OFF computer breaker and

<b>S No</b>	<b>Fault</b>	<b>Items to be checked</b>	<b>Action to be taken by Loco Pilot</b>
	<b>failure</b>	Digital input system failure. check mux circuit.	ensure usage of anti static wrist band.
<b>2.9</b>	<b>Air brake system problems</b>	Check for crew message-Communication link failure MAB.	Recycle micro air brake & computer control breakers Check for tightness of COM card of EM 2000 Check for tightness of CPZ card in CCB system. Check for tightness of VCU connectors and CRJ connector.
		Air brake failure-use loco in LEAD only.	INFORM SHED and work further.
		Air brake failure - use loco in TRAIL only	Check for availability of MR pressure. If available, recycle micro air brake and computer control breakers - conduct air brake self test. If MR pressure is not available, consult shed.
		Air brake fault – BC control failure.	Check for tightness of EPA2 front connector and conduct air brake self test.
		Air brake fault – BP control failure.	Check for tightness of EPA1 front connector and conduct air brake self test.

<b>S No</b>	<b>Fault</b>	<b>Items to be checked</b>	<b>Action to be taken by Loco Pilot</b>
		Air brake fault –BC equalizing control failure.	Check for tightness of EPA3 front connector and conduct air brake self test. Check for tightness of BC equalizing valve connector.
		No blended brake – Lock out.	Conduct blended brake self test. Even if it does not pass, work further and INFORMED SHED.
		Loco Brake not releasing	Conduct self test
<b>2.10</b>	<b>MR Pressure dropping on Run</b>	Check for any external leakage in air flow indicator.	Arrest the leakage
		Check for unusual sound from compressor valves	CONSULT SHED.
		Check for normal operation of air dryer.	If it is continuously purging – put OFF air dryer breaker and work further -INFORM SHED. If after putting OFF AD breaker also, it is continuously purging, shut down loco. Drain MR1 and plug the defective purge valve using a coin and then re-crank the loco.

<b>S No</b>	<b>Fault</b>	<b>Items to be checked</b>	<b>Action to be taken by Loco Pilot</b>
		Check ABD valve working continuously.	Bring the plunger in manual position and drain MR manual at every train stoppage.
		Pneumatic pipe connecting MRPT in compressor compartment may be clogged with moisture.	Close the cut out cock and drain moisture from test plug. Open the cut out cock and again give blow down. Finally open cut out cock and work further.
		Any sanders working continuously	Close MR1 cut out cock and drain out trapped pressure through MR1 J filter. Open MR1 cut out cock and work further.
		Any horns working continuously	
2.11	<b>Simultaneous Forward / Reverse request</b>	Check for crew message -No load simultaneous Forward / Reverse request with alarm	Check for position of reverse handle in control stand. Also check for reverser input in program meter or in power data. In power data, the reverser input is indicated as OPMODE - PROP When it is in Forward or Reverse. Keep the reverser in neutral and see that reverser input will show Idle and in program meter RHSF & RHSR shall show OFF. If

S No	Fault	Items to be checked	Action to be taken by Loco Pilot
			<p>it is not so, operate the reverser handle in Forward / Reverse directions till such time it correctly shows.</p> <p><b>Note:</b> When Reverser is in centre, RHSF &amp; RSHF will show "OFF" in program meter 8S soon as it is in Forward RHSF will be "ON" &amp; RHSR will be "OFF". If reverse is kept in Reverse, then "RHSF will be "OFF" and RHSR will show "ON".</p>
2.12	<b>Simultaneously power /DB request</b>	Check for crew message – No load simultaneous power/DB request.	Check throttles position in EM 2000. It should show Idle whenever throttle is kept in Idle. If it is not SO, operate the throttle in both the control stands and see that throttle position comes to idle. If it does not set take throttle in DB zone and again bring to Idle. Check throttle position on both the controllers In Idle.
2.13	<b>Head light not working</b>	Check for working of both the bulbs.	<p>If one bulb is fused. INFORM SHED and work</p> <p>If both the bulbs are not glowing in Long hood side, check the tightness of 623C, 823D plugs in ECC3.</p> <p>If both the bulbs on Short hood side are not working, check for any</p>

<b>S No</b>	<b>Fault</b>	<b>Items to be checked</b>	<b>Action to be taken by Loco Pilot</b>
			loose cable connection in head light dim resistance inside ECC1 top right comer.
<b>2.14</b>	<b>Flasher light not working</b>	Check for flasher light switch position. It should be ON. Also all the breakers in breaker panel should be ON	If the breakers are ON, and problem persists, Swap 010 1 & 3 and check for the entire flasher switches in 'ON' position In both the control stands. Check for flasher working by applying emergency brake. If flashers are working, start train.
<b>2.15</b>	<b>Flasher light working continuously</b>	Check for the flasher switch position in both the control stands.	If they are in ON position, put OFF the switches. If the switches are in OFF & problem persists, Swap DIO3 with1
		Check for PCS knocked out.	Recover PCS
<b>2.16</b>	<b>White smoke in exhaust</b>	Checks lube oil level.	If lube oil level is increased, consult shed.
<b>2.17</b>	<b>Water level reducing</b>	Check for any external leakages.	Open Pressure relief valve by pulling the handle and tie it. Clear the section and consult shed.

<b>S No</b>	<b>Fault</b>	<b>Items to be checked</b>	<b>Action to be taken by Loco Pilot</b>
2.18	<b>Engine is not cranking</b>	1.No Fuel oil 2.No Lube oil 3.No water 4. Gov. LLOB may be in tripped condition 5.OSTA may be tripped 6. Low water switch button & crank case pressure button of EPD may be tripped. 7. Battery knife switch may be open or starting fuse glown up. 8. EFCO may be in pressed condition. 9. MUSD may be in pressed condition. 10.Fuel pump and switch may be in off condition 11. Circuit breaker on control circuit panel may be in off position. 12. Engine	1.Check fuel oil level 2.Check lube oil level 3.Check water level 4.Reset it if tripped  5.Reset it if tripped 6.Reset if tripped  7. Check battery knife switch  8.Check EFCO  9.Check MUSD  10. Check fuel pump and switch  11. Check circuit breakers  12.Put ECS on Idle

<b>S No</b>	<b>Fault</b>	<b>Items to be checked</b>	<b>Action to be taken by Loco Pilot</b>
		isolation switch may be in RUN position 13. Improper sequence of switches in working & non working control stand	13.Check sequence

<b>2.19</b>	<b>Throttle not responding</b>	1.Check isolation switch in run position 2. any one control circuit breaker may be tripped 3. Check PCS may be knocked off 4. Check WW Gov.LLOB 5. After putting ON-TLPR & main control circuit breaker, wait for 35 minutes.	1.Put it on RUN  2. Reset it if tripped  3.Check it  4.Reset LLOB if tripped  5.Ensure the same
-------------	--------------------------------	---	---

<b>2.20</b>	<b>Engine cranking but not starting</b>	1. Check starting motor, gear may be	1.Check motor
-------------	---	--------------------------------------	---------------

		slipped 2. TLPR in ON condition	Check TLPR
--	--	--	------------

<b>2.21</b>	<b>PCS Knocking off</b>	1.L/T switch may be in wrong position 2. Control stand A-9 & SA-9, Reverser & throttle may not be in correct position	1.Check position  2.Put them in correct position
-------------	---------------------------------	---	---

<b>2.22</b>	<b>Continuous wheel slip</b>	1.Recycle TCC1or TCC2 circuit breaker 2.If required isolate TCC1or TCC2 alongwith ACGTO1& ACGTO2 3.After isolation for goods train work with 60% load 4.If wheel slip indication flashing, it means there is	1. Follow recycling procedure  2.Isolate TCC1 or TCC2 if required  3.Follow the instructions  4. Check wheel slip indication and act accordingly
-------------	--------------------------------------	---	--

		a possibility of slipped pinion, computer will detect concerned traction motor	
--	--	--	--

## 2.23 AIR BRAKE TROUBLE SHOOTING

SNo.	Defect	Action to be taken by Loco Pilot
1.	<b>MR Pressure Dropping</b>	1.Check air leakages from FP,BP, BC, Auto Drain, Air Dryer, Radar Blow, Sanders & cooling coils 2.After attending ensure engine RPM coming to idle (During air leakages, engine RPM will increase due to AIR Compressor operation) 3.If Air dryer purge valve, or drain valves are blowing continuously it may be plugged with a threaded plugged. 4.If MR1 and MR2 ABD (Auto blow down) valves are blowing then close ABD valves to manual side
2.	<b>Unusual sound from compressor</b>	1.Check for correct compressor oil level if found less than low mark shut down the loco & inform shed 2.If any unusual sound from LP & HP cylinder, inter coolers and safety valve or any air leakage inform shed to confirm whether to continue working or not.
3.	<b>Improper loading and</b>	1. Close MR1 'J' filter COC and drain out the trapped moisture in

	<b>unloading of air compressor</b>	<p>MR1 system, when MR safety valve starts blowing keep MRI COC to normal open position.</p> <p>2.Close MRPT COC drain and trapped moisture by pressing the spring loaded MRPT quick connector stem, ensure increase in ENG RPM with blowing of MR safety valve and then close MRPT COC to normal open position.</p> <p>3.If the trouble still continues close MRPT COC and take advice from shed for further movement.</p> <p>4.Recycle computer control circuit breaker the trouble very set right.</p> <p>5.MVCC struck up, Improper loading. Press and release the 'T' handle on the MVCC unit.</p>
4.	<b>BP dropping and PCs Knocking out</b>	<p>1.Check AIR FLOW indication for needle shooting.</p> <p>2.Check the leakages on the formation and arrest the same.</p> <p>3.Check for any air leakage from both control stands. This may be due to stuck up A9 or Fireman Emergency air valves.</p> <p>4.If A9 emergency valve in stuck up in open position, throw A9 handle to emergency sharply 2 or 3 times &amp; then bring to Run position to RESET.</p> <p>5.If A9 emergency valve air leakage still continues. Dummy the air passage with dummy cap of BC equalizing pipe.</p> <p>6.Check if AEB circuit breaker in</p>

		wrongly put ON
5	<b>Air brake failure with crew message Air brake failure use loco in trail only</b>	<ol style="list-style-type: none"> <li>1. Recycle MICRO AIR BRAKE.</li> <li>2. Conduct Air Brake self test</li> <li>3. If problem still continues, apply hand brake provide skids shut down loco and drain MR1 and MR2 completely close COCs properly. crank the loco again and conduct self test.</li> <li>4. If no further improvement use this loco as an MU trailing unit taking full power of the loco.</li> <li>5. Open CCB cover &amp; inform shed the fault code number on display screen of CCB for further action.</li> </ol>

**Note:** At time SELF TEST may fail but Air Brake system works normally. In such case give message and work up to destination.

## 2.24 AIR BRAKE SYSTEM-TROUBLE SHOOTING IN GHAT

SNo.	Cause/Defect	Remedial action
1.	<b>MR pressure dropping with EM 2000-Crew message "LOW MAIN RESERVOIR EQUALISING PRESSURE USE LOCO IN TRAIL ONLY" FC 2977 in lead working loco.</b>	If unable to attend. Close MREQ COC in both LEAD and TRAIL loco MU end. Keep LEAD TRAIL switch in lead loco from LEAD mode to TRAIL mode, and keep TRAILING loco TRAIL mode to LEAD mode.
2.	<b>If MR pressure dropping other than LEADING loco.</b>	The loco where the MR is dropping both end

		MREQ COC to be closed.
3.	<b>BC EQ –Hose pipe burst causing MR pressure dropping.</b>	Close the BCEQ COC in both end of the MU coupled locos. The TRAILING loco which is disconnected from BCEQ towards the train end LEAD TRAIL switch to be moved from TRAIL mode to HLPR mode.
4.	<b>“AIR BRAKE FAILURE USE LOCOMOTIVE IN TRAIL ONLY” FC 2975 in LEAD / HLPR loco if experienced with BP leaking.</b>	Keep LT switch from LEAD/HLPR mode to TRAIL mode and keep TRAILING loco LEAD TRAIL switch from TRAIL mode to LEAD/HLPR mode duly ISOLATING BP TO LEAD loco to avoid BP leaking
5	<b>Air brake failure other than LEAD / HLPR mode locos in MU’s (or) TLC.</b>	Permitted to work continuously from LEAD/HLPR loco. Whenever the failed loco required working LEAD/HLPR AB self test to be conducted to clear the fault.
6.	<b>Air brake failure in the MU HLPR mode loco(down the ghat) (or) TLC (up the ghat)</b>	Keep L/T switch from HLPR mode to TRAIL mode and keep L/T switch in MU/TLC loco from TRAIL mode to HLPR mode.
7.	<b>Air brake penalty not getting reset even after keeping auto brake handle 10 seconds in FS or 60 seconds in emergency position.</b>	Keep auto brake handle in run position and keep L/T switch from LEAD mode to TRAIL mode for 10 seconds again keep from TRAIL mode to LEAD mode. If problem still exists recycle

		MICRO AIR BRAKE BREAKER with COMPUTER CONTROL BREAKER.
8	At any situation 2 control stands in one MU consist the L/T switch should not be kept in LEAD/HLPR MODE	If both control stands L/T switch by mistake happened in LEAD/HLPR MODE then A/B self test to be conducted to clear the fault to work in LEAD/ HLPR
9	To make LEAD MODE MU consists to couple with another MU consist any one control stand to be kept in HLPR MODE only	BCEQ pipe should not be connected between LEAD MODE MU/TLC and HLPR MODE MU/TLC.

## 2.25. IMPORTANT DO's AND DONT's FOR LOCO PILOTS & SHED MAINTENANCE STAFF

### DO's

- 1 DO-Let the locomotive warm up properly to the desired temperature of 125°F(55°C) before attempting to move the locomotive. (The locomotive raises engine speed to 3rd notch RPM automatically till the temperature is obtained).
- 2 DO-Ensure cranking of the locomotive at least once in 24 hours to make sure that there is no hydraulic lock up if the engine has not been cranked for more than 24 hours by barring the crankshaft manually.
- 3 DO-Ensure pre-lubrication of the engine (to be done by maintenance staff) if the engine has not been cranked for more than 48 hours.

- 4 DO- Follow correct cranking and shut down procedures to enhance engine and turbo life.
- 5 DO- Ensure all brakes are released properly before moving the locomotive.

### **Dont's**

- 1 DON'T – Raise the engine beyond 4th notch without load.
- 2 DON'T– Spill tea / coffee or other eatables on control stand or cab. (The sensitive air brake equipment in control stand and air brake compartment may malfunction)
- 3 DON'T– Permit incorrect lube oil, governor oil or coolant water to be added in the locomotive.
4. DON'T- Permit bad quality sand or wet sand to be added in the sand boxes.
5. DON'T– Stable the locomotive without applying the hand brake.
6. DON'T– Move your train unless you physically check that the brakes are active.

## C- CHAPTER – 3

### TROUBLESHOOTING BY SHED MAINTENANCE STAFF

#### 3.0 GROUND RELAY

1. If the message of Ground Relay tripping experienced, confirm fault is in Power or Dynamic Braking mode. If fault recorded as 'Ground Relay' in Power mode, first isolate the Trucks one by one to confirm the Faulty truck and disable faulty truck.

#### **- Ground Relay Power:**

2. To start with, conduct Excitation Test. If GR trips check TA for failed Diodes & Fuses, spring loaded indicator in "Popped out" condition indicates a failed fuse indicating the failed diode connected to the fuse.
3. Check MGTB for cracks, melted connections, wire rubbing with covers.
4. Check AC cables for insulation damage below MGTB.
5. Check surge suppression Resistor for damage, capacitors for grounding, bulging, leakage etc.
6. Check cabling up to ECC1, & high voltage areas (Red painted) inside ECC1.
7. Check GRT,T2 & phase imbalance circuit resistor & diodes. Conduct load test & verify is GR operating.
8. Check Traction motor cabling for any damage of insulation; mostly at the cleats where car body cables and motor cables are joined and secured inside umbrella boot. Release both Top & Bottom cleats, check for damaged insulation, carbon deposits etc.,
9. Check Traction Motor cable supporting cleats for any flash marks/ burnt marks and insulate with high voltage insulation tape.
10. Check TCC outgoing Terminal post cable connection for burnt connections and touching to body.

11. Check Traction Motor by removing inspection cover of the motor for any metal pieces - usually, flash marks in the stator windings, molten copper pieces, broken bellow pieces, damaged rotor bar end rings etc.,
12. Check Damping Resistor cables & IPR cables inside the central air compartment (Gen. room) particularly where it is tied with the looming bar. IPR bus bars should not be rubbing with Mica insulator which can cause GR to trip. Ensure that there is no tracking above insulator.
13. Check for water falling over IPR1 from top hood.
14. ECC2 should be free of water & dust.
15. Check visually any insulation damages and Grounding of cables in ECC2, '62A Terminal Board' and decoupling reactor.
16. Check back side clearance for DCL reactor it should be more than 5 mm.
17. Check 3G2A plug connections and Pins for proper locking and for proper harness. Check for any flash marks inside the plug.
18. Check the L1,2,3 reactor inside inverter cabinets supporting insulator for breakages. If again GR Trips measure IR of power circuit.

### **3.1 GROUND RELAY DYNAMIC BRAKE, LOAD TEST**

1. For "Ground Relay Dynamic Brake, Load test", Check all Grids for Flash marks near ribbon element or any damage to the insulator.
2. Check for any foreign metal pieces, which are connecting element to Ground.
3. Inspect for water entry inside the DB motor (Grid Blower Motor) through the top bolts of blower.
4. Check both Grid Blower Motors for flash marks on Terminal connections, commutator marks & heavy

carbonization, Hanging of Brushes, damaged winding and internal cabling.

5. Check Grids ribbon holding insulators at the Top & Bottom for Flash marks, tracking, cracks etc,

Note: If Grounding Problem is experienced in Dynamic Brake mode only & unable to find the cause enroute, Dynamic Brake function can be disabled by Dynamic Brake cut out switch provided in ENG control panel. Loco will work Normal in Power but no Dynamic Brake is available.

### **3.2 NO DYNAMIC BRAKE (OR) LOAD TEST, GRID RESISTANCE PATH 1 (OR) 2 ARE TOO LOW:**

1. Observe DCLV Feedback on EM 2000 screen while conducting Load test, if it changes according to notches, it is OK, if not, check REVDCL continuity and Resistance value (200 K ohms+/-2%).
2. Check VDCL connections continuity from "B1 and B2 Grid contactors" through REVDCL and connections at VDCL (RD, WH, BK).
3. Check VDCL transducer if faulty Renew.
4. Check VDCL connector at "PDP" plug, connectors connecting the "ADA" module, at the rear side of EM 2000 chassis. Replace ADA module.
5. Check Gen field winding for open circuit, worn out brushes, damaged springs.
6. Check for defective GFC or GFD contactors.

### **3.3 NO DYNAMIC BRAKE (OR) LOAD TEST – GRID RESISTANCE PATH 1 (OR) 2 IS TOO HIGH :**

1. Check REVDCL for continuity and for Resistance value 200 K ohms +/-2% and VDCL connections.
2. Check "Grid 1A & Grid 2A" current transducer feedback while conducting Load test. It should not be

- 'Zero' (or) -ve value, if so, check current transducer of faulty path and the connector in "PDP plug".
3. Check "ITCC current transducer" feedback while locomotive loading, it should not be Zero (or) -ve, if so check "ITCC transducer connections (RD, BK & WH)" and connector at "PDP plug".
  4. Check all the grids for open or burnt connections and resistor ribbon element for open circuit.

### **3.4 LOCKED WHEEL (OR) SPEED SENSOR FAULT: (In case of accompanying the loco or receiving message from line)**

1. Stop train and verify for free rotation of wheels.
2. Select "speed meter screen" from EM 2000 and observe TMs feedbacks by moving locomotive. All TM RPMs should be in same direction and values are to be near equal.
3. If any one of the sensor feedback is less than the others (or) Zero; Check for unusual sounds from wheel axle bearing, motor & Gear case and ensure free rotation of wheel.
4. If wheel is rotating freely, Check "speed sensor plug" pins for pushback and for any damage to insulation.
5. Check 'X' plug (XA, XB & XC) connections of faulty speed sensor.
6. If it is speed sensor fault, which cannot be attended enroute, disable speed sensor feedback in EM 2000 computer by selecting "Lock wheel detect" in Main menu. If possible disconnect the defective speed sensor plug from its position (located at the top of the Traction Motor). Secure the plug properly.
7. If any of the TCC cards C075, C083, G059 & G067 are found to be faulty, replace faulty TCC card.  
If TM1 & TM2 or TM4 & TM5 speed sensor feedback is wrong, then G059 or C075 may be defective. One by one, the defective card is required to be identified.

If TM3 or TM6 speed sensor feedback is wrong, then replace G067 or C083 card.

8. Conduct stall test and observe speed meter screen to check TM RPM are Zero. If any of the Motor is showing speed and the locomotive is standstill, it can be case of slipped or broken pinion.
9. Ensure No hand brake application and brake cylinder are releasing fully.

### **3.5 SPEED SENSOR DISABLING PROCEDURE**

1. Select main menu on computer display.
2. Take cursor to lock wheel detect and select.
3. Take cursor to the axle which is to be disabled and press disable.
4. Crew message appears for correct disabling.  
Note: Whenever computer control breaker is recycled it is necessary. Follow the above procedure again.

### **3.6 CUTTING OUT TRUCKS**

1. Press main menu on computer display.
2. Take cursor to traction cutout and select.
3. Disable the required truck.  
Note: Keep isolation switch in isolate, throttle in idle and reverser center before cutting out truck.

### **3.7 COMPUTER TURNED OFF OR RESET WHILE REVERSOR IS NOT CENTERED (OR) COMPUTER IS LOADING:**

1. Ensure power supply modules are functioning properly. (PRG, PSM 300, PSM 310 & PSM 320) from its 'GREEN' indication on face plate of module.
2. Check for PRG connection plug (Back panel to power supply chassis) loose connection (or) poor locking of pins.
3. Check for flat Ribbon cable which carries +5V & +/- 12V power supply to EM 2000 chassis from power

- supply carries for rubbing to metal body insulation damage & improper locking etc.
4. Check for any overloading of power supply module PSM 320 by opening plugs of 'BAROMETER' 'RADAR' unit and MRPT With this, the red LED fault signal should go off and Green LED signal should glow. Under such circumstances, that particular component can be assumed as faulty. If the Red Light signal is still ON, then PSM is defective.
  5. Check Computer control breaker connections.

### **3.8 TCC # GTO POWER SUPPLY UNDER VOLTAGE OR NO AUX. GEN OUTPUT:**

1. Is GTO power supply under voltage recorded in both TCC's at same time. If yes;
2. Check Aux. Gen output. FCD Green LED Indication should be ON.
3. Check Aux. Gen drive shaft and coupling for any damage.
4. Check Battery charger assembly and Aux. Gen output breaker position and for any loose connections.
5. Confirm "PS GTO output OK (Green LED in on condition).
6. Check DVR plug connection and change DVR module if malfunctioning.
7. Check Aux. Gen field & Diode rectifier for bad soldering and burnt diode plate etc,
8. ECC1 back panel "33C TB connections" and "3G2A plug connector" for loose connections or burnt plug.
9. Check all X-Plugs for pushed back pins melted pins and damaged wire loop inside the X-plugs.
10. Check 'RE AG FLD' connections & the Resistance.

11. If the problem is in only one TCC, check GTO power supply circuit breaker, GTO PS unit, connectors, X-Plugs and TCC cards of that TCC.
12. Check AUX. GEN field & feedback breaker & connections

### **3.9 NO COMPANION ALTERNATOR OUTPUT**

#### **CHECK AUXGEN FIELD BREAKER :**

1. Check any additional Message like “NO AUX. GEN OUT PUT- Check Aux. Gen. Field breaker” is figuring. If ‘Yes’ follow Trouble shooting procedure for No. Aux. Gen output.
2. Programme ‘CAV’ and ‘CA full’ in computer & 116 check for a minimum of 40 volts and 26 Hz in idle condition.
3. With millimeter, check the Companion Alternator output at test points in Circuit Breaker panel & at Bus bars in ECC3 cabinet.
4. Shut down engine and check Companion Alternator slip rings, brushes, connections, springs etc., for scoring, condemned brushes, broken connections etc.,
5. Open Companion Alternator output Terminal Board cover and check for any loose connection, burnt terminals etc.,
6. Check connections near Bus bar inside ECC1, GF Breaker, AC control Breaker.
7. Check CA field connections inside ECC2 & at MGTB.
8. Change FCF Module and then CPU.
9. Check CA field winding resistance.

### **3.10 DC LINK UNDER VOLTAGE PROBLEMS:**

1. Check ENG rpm feedback as per throttle position in Load Test.
2. Conduct Excitation Test.

3. Programme DCLV, T1 DCLV & T2 DCLV in programme meter and conduct stall test. All the three should be near equal.
4. If anyone is Zero or less, It's circuit is required to be checked by qualifying Wiring, Resistance value, transducer, connectors and the feedback module.
5. If DCLV is at fault check 'REVDCL' VDCL transducer and ADA card 6. Check VDCL plug at PDP.
7. Conduct excitation self test and attend if test fails.
8. Check GF breaker - If tripped, the following aspects are to be checked:-
  - a) Current transducer (IMGF) may be at fault.
  - b) GF contactor may be defective.
  - c) Governor may be defective as its Load regulator is not functioning.
  - d) Breaker itself is defective.
9. Check for radar feedback problems.
10. If fault is in DB, check DB gride.
11. Check for ground relay tripping faults.

### **3.11 DC LINK OVERVOLTAGE FAULTS :**

1. Check Eng rpm is as per notch position.
2. Conduct excitation test.
3. Check speed sensors feedback and fluctuation.
4. Check radar functioning.
5. If fault is only in DB check DB gride and motor.
6. Check sanders and direction of operation.
7. Check REVDCL, VDCL, ADA and associated wiring.
8. Check TA bearing and alignment with engine.  
If fault is in only one TCC
  - a) Check TCC voltage transducer
  - b) Gate units
  - c) Output voltage and current transducers

### **3.12 EXCITATION TEST FAILING:**

1. Check GF breaker and correct 3 phase supply from comp. Alternator.

2. Check GFC, GFD and IMGF.
3. Check FCF, FCD, ADA and FC distribution box.
4. Check SCR bridge for loose diode connections shorted diodes or SCRS.
5. Check MA slip rings brushes and field connections and resistance.
6. Check for correct phase rotation and gating signals.

### **3.13 LOW HORSE POWER PROBLEMS**

1. WDG4/WDP4 locos will achieve full horse power only above 25 KMPH.
2. At Eng temp above 95 C the HP starts dropping gradually and at 100 C it drops to 6 th notch HP. Check Radiator fan working and check for tripped circuit breaker/blown out fuses inside ECC3 cabinet.
3. Check Engine Air filter dirty message is active isolate EFS and FVS switch inside ECC1. Ensure baggy filter are not cyclonic filter are not clogged and dust bin blower is working OK.
4. Ensure both truck are in enabled condition & are working.
5. Check for TCC over temp or hot traction motor fault. Allow TCC/TM to cool down by raising engine rpm with reverser center.
6. Check for radar malfunctioning sanders not operating.
7. Check bar pressure feedback, it should be above 90 on computer display.

### **3.14 AUTOMATIC SHUTTING DOWN OF THE LOCOMOTIVE**

1. Check for controller feedbacks in EM 2000 screen by programming required parameters.
2. Check supply to governor Amphenol plug.

### **3.15 ENGINE SPEED FAILURE:**

1. Conduct Load test and Ensure Eng rpm is as per throttle position.

2. Program EPU rpm & Engine rpm and ensure both are same.
3. Check “FCF Module”, “ADA” and “CPU”.
4. Check governor amphenol plug.
5. Check companion alternator output AC control breaker.
6. Check proper fuel supply to engine/fuel system.
7. Check stuck up racks.
8. Check the function of turbo clutch.
9. Check governor. Check fuel oil return sight glass for bubbles in load test ‘TH 8’

### **3.16 TCC # 1 or 2 communication link failure:**

1. Keep throttle in idle, reverser in centre, and isolation with in isolate position.
2. Recycle the related TCC computer breaker and EM 2000 computer breaker faulty TCC and check front plug and connections of C003 card and change C003 card if faulty.
4. Ensure communication wires continuity from C003 front plug through XD plug to 10A and 10B connections to COM card and Signal Distribution BOX.

### **3.17 Procedure for recycling of circuit breaker:**

1. Stop the locomotive.
2. Secure the loco by
  - (i) Apply SA9/hand brake.
  - (ii) Keep throttle handle.
  - (iii) Keep reverser neutral.
  - (iv) Isolation switch on isolate.
  - (v) ER off.
  - (vi) GF off.
3. Switch off computer circuit breaker
4. Switch off concerned circuit breaker (TCC1, TCC2, MAB, auxiliary generator, breakers etc.).
5. Wait for 20 to 30 seconds.

6. Switch on concerned circuit breaker.
7. Switch on computer circuit breaker.
8. Recover air brake penalty by keeping A9 on FS for 10 seconds.

### **3.18 COMMUNICATION LINK FAILURE - MAB:**

1. Recycle Micro 'Air Brake' and computer control breaker by stopping train and keeping Isolation switch to isolate position, Reverser in centre and throttle in idle position.
2. Ensure continuity of communication cable from "CRJ 10 plug" to SIG Distribution Box through "314A plug" (underneath DCL with gear). Ensure the tightness of communication cable connector CRJ-10 with CRU assembly through single white cable. (Location: inside the driver cab near the CCB right hand bottom corner)
3. If everything is OK, then change 'COM' card with another Good 'Com' card. Keep computer control breaker in OFF while changing the COM card and put ON after changing.
4. If problem repeats renew CPZ card of CCB.

### **3.19 LOAD METER NOT RESPONDING:**

1. Check for crew Message on EM 2000 screen and attend accordingly.
2. Ensure "GF Req" input feedback ON while moving throttle 1 through 8.
3. Ensure energizing of GFD and GFC contactor and for input feedbacks to EM 2000 with isolation switch in RUN and Reverser in either direction respectively.

4. Check for MGFLDA current transducer feedback from EM 2000 screen according to the notches.
5. Check "MGTB" for loose or open Traction Alternator field connections.
6. Check slip ring brushes & Traction Alternator Field coil connection brass bolts for any damage.
7. Check field coil Resistance & continuity.
8. Ensure VPC contactor has picked up.
9. Check MG Fld. Breaker position and ensure it is in ON position.
10. Check LR% max. input in computer and it should be 100%. If less or Zero, fault could be with Governor, Engine, and Fuel system.
11. Change ASC & ADA Module and see LR changes.
12. Check Governor Amphenol plug.
13. Ensure Eng rpm is raising according to throttle position and governor request.

### **3.20 LOAD METER FLUCTUATIONS**

1. Conduct Load Test and verify Horse power, Eng. RPM & LR% are within the prescribed limit.
2. Check Crew message and Fault Archives for any ACTIVE messages.
3. Conduct RADAR test and check Radar feedback while moving with load.  
T1+dN - Not to be 3600  
T2+dN - Not to be 3600  
and Radar status flag 'O' when speed is beyond 4KMPH,
4. Check for any wheel slipping.
5. Conduct Radiator Fan Self Test and Verify fan rotation.
6. Check operation of Sanders and direction of operation, it should match with that of the Reverser direction.

### **3.21 LOAD METER NOT RESPONDING BEYOND 1<sup>ST</sup> NOTCH**

1. Check for Amphenol plug of Governor for correct locking. Open AMPHENOL plug (When reverser is in centre and throttle in Idle, ENG isolation switch in isolate position and Computer OFF)
2. Check Male & Female Pins of the plug and provide.
3. Check controller switches feedback and governor valve operation according to notches.
4. Check power supply for Amphenol plug.

### **3.22 EXPERIENCING JERKS FROM TRUCKS**

1. Observe speed sensor feedback of Traction Motor from Speed Meter screen. If any of the speed sensor direction is opposite change speed sensor if possible or disable speed sensor and open plug at Traction Motor and secure.
2. Check Radar feedback, conduct self test and check sanders operation.
3. If jerks are experienced only in DB, check “TL 24T” voltage feedback from controller, voltage should gradually increase from ‘0’ volts to 72volts in steps with DB handle position movement from setup to DB 8th position.
4. Check TCC#1(or) 2 outgoing connections for slackness.  
Note: Do not touch any power cable without following discharging procedure (conduct DCL shorting test and Isolate isolation switch).
5. Check all Traction Motor connections;
6. Check TCC down loads for GTO Monitoring or output low frequency faults and act accordingly.

### **3.23 HEADLIGHT PROBLEMS:**

1. If only one headlight is not glowing first swap connections of the fused H/L with that of other Good Headlight, if problem is shifted to adjacent one, then probably the headlight Resistor is defective; change it. If the problem is not shifted to other headlight, change fused lamp.
2. If both the headlights are not working from L/H side first check 823-C plug in ECC3 compressor side for any slackness of plug and melting of pins.
3. If plug is alright; trace out for supply to H/L
4. Check for switch problem and the breaker defect.

### **3.24 DIGITAL INPUT SYSTEM FAILURE:**

1. Check in EM 2000 Main menu - Data meter screen select multiplexer and see.
2. All MUXON should be ON. All MUX OFF should be OFF. All MUXSEL should be ON. If anyone is not correct, check that input.
3. Try out swapping DIO-1 with DIO-3 or DIO-2 with DIO3.
4. Check for multiple low voltage grounds.
5. Check CMU, DIP and PD plugs.

### **3.25 FLASHER LIGHT NOT WORKING OR CONTINUOUSLY WORKING:**

1. Check Flasher switches are "ON Position" in control stands.
2. All Breakers in "Circuit breaker" panel should be ON.
3. If both side not working, swap DIO-3 with any other DIO.
4. Check Flasher light and wiring.
5. Check Flasher resistance.

### **3.26 ENGINE NOT CRANKING:**

1. Check Crew message.
2. Check LLOB button, OSTA, Low water & Low crankcase buttons.  
Note: Do not crank if low crank case button is in tripped condition.
3. Check for Fuel pump running & clear fuel oil in return sight glass.
4. Check Engine for free crankshaft rotation by barring with crank over tool.
5. Check ST & STA operation in starting system menu while cranking.
6. Check Battery voltage & measure voltage drop while cranking. It should not drop below 25 volts.
7. Try changing out PRG module if computer goes blank while cranking.
8. Check “knife switch” connections, contacts, starting fuse and battery connections, starter motor connections and ST contactor connections.
9. Check ST contactor tips by opening cover.
10. Ensure both start motors are engaging with ring gear and cranking.
11. Check baggy filters and turbo.

### **3.27 FILTER BLOWER MOTOR BREAKER IS NOT CLOSED:**

1. Ensure filter blower motor breaker is closed if the breaker is tripping.
2. Check and ensure proper locking of connector on the filter blower motor.
3. Check for free rotation of impeller through inspection window.
4. Check for any unusual sound (rubbing or hitting sounds).

5. Check motor current with clamp meter for “Full load current of the motor”. It should be max of 21 A@200 VAC.
6. Check for correct “Three phase supply” is available at motor connector.
7. If not check “322A plug”, Filter blower circuit breaker and proper companion Alternator output supply.  
NOTE: Connector on the motor can be disconnected and worked further after putting ON the breaker.

### **3.28 FUEL PUMP MOTOR BREAKER IS TRIPPING:**

1. Check fuel pump motor current (Should not be more than 10.1A @ 74 VDC)
2. Check for any unusual sound due to bearing seizure or pump over loading. Check any shorting of input supply cables inside the terminal box.
3. Check fuel pump inverter for internal failure.

### **3.29 NO GRID BLOWER MOTOR CURRENT OR GRID BLOWER MOTOR CURRENT IS TOO HIGH :**

1. Check DB motor supply connections at terminal board (Both inside & outside). Check grid blower motor connections tapping at DB grids.
2. Check carbon brush, brush holders and commutator condition.
3. Check grid blower current transducer and feedback plug in PDP.
4. Rotate DB motor fan by hand & see motor is rotating freely and bearing is not seized.  
NOTE: First visually check whether motor is working (if rotating check feedbacks).

### **3.30 RADIATOR FAN MOTOR NOT WORKING**

1. Conduct Fan Test and check for proper function of contactors.

2. Check continuity of Fan Fuses in ECC3 cabinet.
3. If Circuit breakers are provided reset if tripped.
4. Check Companion alternator output is available.
5. Check for “intactness” of supply cables inside ECC3 cabinet as well as motor side.

### **3.31 FUEL PUMP MOTOR IS NOT WORKING**

1. Check whether fuel pump relay has picked up (Ensure by seeing RED Flag indication in Relay unit at Right top).
2. Check for 64/74VDC at fuel pump motor Connections.
3. Check and ensure that FPR < ON & FPR > ON signals from EM 2000 starting system menu.
4. Check & ensure that FP & control switch is ‘ON’ in L/H C/S EFCO switch is Not in closed condition & MU button Red colored ‘STOP’ button is not in pressed condition.
5. Check Fuel pump inverter.

### **3.32 TURBO LUBE PUMP MOTOR IS NOT WORKING**

1. Check for 64/74VDC supply available at TLPM terminals.
2. Check for TLPR breaker and computer breaker are ‘ON’.
3. Check the TLPR whether it is picking up or not.
4. Check TLPM brushes and springs (DC motor). (Pick up ‘Red Flag on Relay’, Drop out - ‘Green Flag on Relay’)

### **3.33 DCOP FAILED TO PICK UP/DCCL FAILED TO DROP OUT:**

1. Conduct DCL switchgear test in contactor & relay test. Also visually inspect operation of switchgear.

If it is continuously operating, DIO output channel is shorted, SWAP'DIO2' with other DIO preferably DIO-3.

2. Check connections on the Terminal block of DCL switch assy.

### **3.34 BATTERY CHARGING AMMETER SHOWING DISCHARGE SIDE**

1. Check & confirm that there is no Message like "No Aux. Gen output - Check Auxiliary Generator Field Breaker".
2. Check for any loose battery connections. If everything alright, then meter is defective.
3. Measure battery charging voltage if less than 68 V check BC ARM DVR renew accordingly.
4. Renew BC Am meter
5. Check for glowing of green LED on FCD module

### **3.35 TCC # FAILED TO ACKNOWLEDGE DIRECTION REQUEST**

1. Check for communication cards of EM 2000 and the TCC.
2. Check all the X-plugs of TCC.
3. Check the connector at signal distribution box and EM 2000 mother board for any loose connection & pin not mating properly.

### **3.36 HORN CONTINUOUSLY WORKING:**

1. Check whether magnet valve stuck up in ON condition.
2. Check Horn Button stuck up in ON condition.
3. Disconnect Magnet valve coil wires & check.
4. Check for Low voltage grounds.

### **3.37 EVENT RECORDER COMMUNICATION FAILURE**

1. Recycle event recorder circuit breaker
2. Check the unit for communication with EM 2000 for display of software ID in unit information.
3. Check the power supply connector & RS 485 connector in the unit.
4. Check RS 485 connector at the Signal Distribution Box.
5. Renew COM card, Event recorder accordingly.

### **3.38 TCC COMPUTER OR TCC BLOWER CIRCUIT BREAKER NOT CLOSED**

1. Check for tripped TCC blower or TCC computer breaker, reset if tripped.
2. Check backside interlock for open wire connection.
3. Check wiring as per schematic.
4. Change DIO module.

### **3.39 TCC BLOWER CONTACTOR FAILED TO PICK UP**

1. Check whether contactor physically picked up or not.
2. If picked up feedback problem check interlock connection and wiring.
3. If contactor not picking up check coil supply coil resistance.
4. If supply not available check DIO output, wiring, PD plug etc.
5. Change DIO module.

Note: Feedback wire may be temporarily bypassed and loco can be worked until the section is cleared.

### **3.40 AIR DRYER MALFUNCTIONING**

1. Air dryer should purge only when DCR relay is picked up.
2. Above 485 rpm DCR permanently remains in ON.

3. Below 485 rpm the DCR should get ON whenever MVCC is OFF and compsyn relay is ON.
4. DCR Plug should get supply in following sequence.  
A Pin - + 72 V  
B Pin - + 72 V  
Whenever DCR is ON  
C Pin - - 72 V

### **3.41 WATER LEVEL REDUCING :**

1. Head to Liner gasket joint leakage in engine.
2. Water inlet tube to power assembly joint leakage.
3. Radiator/Radiator vent leakage.
4. Head to liner gasket joint leakage in Air Compressor.
5. Water drain cock leakage.
6. Engine water 'Y' manifold bottom gasket joints leakage.
7. Any crack/damage in power assemblies.
8. External leakage from dresser & flange joints or external piping system.
9. Water outlet elbow leakage, After- cooler tube leakage & pipelines joint leakage.
10. Water leakage from water pump seal.

### **3.42 WATER SYPHONED OUT**

1. Radiator Fans not working.
2. Damaged Power assembly.

### **3.43 UNUSUAL SOUND FROM TURBO END**

1. Defective Turbo making humming sound.
2. Defective planetary gear train in Turbo.
3. Rubbing of impeller with main casing.
4. AUX.GEN drive unit back lash not adjusted properly.
5. Improper seating of exhaust valve, broken exhaust valves, injector dribbling, defective power assembly.
6. Defective Injector.

### **3.44 LOW COMPRESSION PRESSURE IN CYLINDER**

1. Improper exhaust valve timing adjustment.
2. Improper exhaust valve seating.
3. Crack/damage in exhaust, valve disc.
4. Worn out piston rings.
5. Exhaust valve bent, defective cylinder heads.
6. Improper seating of valve guide.
7. Cracked piston.

### **3.45 LR NOT MATCHING :**

1. Defective injector.
2. Fuel racks not adjusted properly.
3. Injector output less.
4. Defective Governor.
5. Chocked Air filters.
6. Defective OSTA trip pawl (Injector rocker arm lifted condition)
7. Defective clutch.
8. Improper working of fuel pump.
9. Less Fuel in Fuel tank.
10. Improper adjustment of injector timing & exhaust valve timing.
11. Engine inlet air leaking from After- cooler/Housing joint.

### **3.46 LLOB TRIPPING**

1. Malfunctioning of Turbo Clutch.
2. Engine oil pressure sensing pipe to Governor damaged / leaking.
3. Fuel contamination in lube oil.
4. Defective hot oil detector.
5. Defective Governor.
6. Clogged Turbo supercharger spin on filter.
7. Defective pressure relief valve.

8. Heavy oil leakage from cam shaft bush bearings.
9. Heavy oil leakage from Stub shaft, rocker arm rollers.
10. Leakage in lube oil dust bin blower manifold.
11. Defective main lube oil pump.
12. Manifold connecting to turbo spin on dummy missing.

### **3.47 PINCHING OF LASH ADJUSTER:**

1. Defective Lash adjuster.
2. Defective valve bridge.
3. Damaged exhaust valve locks.
4. Improper exhaust valve timing.
5. Exhaust valve disc breakage.
6. Exhaust valve spring cut, or valve bridge spring broken
7. Inadequate lube oil supply to lash adjuster.

### **3.48 SMOKE FROM TOP DECK:**

1. Crack in piston crown.
2. Drilled through threaded hole on piston crown.
3. No oil supply to Aux. Gen. drive.
4. Exhaust valve guide breakage.

### **3.49 LESS CC VACUUM**

1. Top deck covers not closing properly.
2. Defective sump covers.
3. Defective top deck cover sealing.
4. Clogged eductor.
5. Clogged eductor flexible hose/damaged eductor.
6. Wrong choke provided in eductor.
7. Worn out piston rings.
8. Worn out felts in free end oil seal.
9. Power assembly liner seal hardened.
10. Exhaust valve guide broken.
11. Piston cracked.
12. Head seat ring damage.

### **3.50 MORE CC VACUUM:**

1. Wrong choke provided in Eductor.
2. Larger dia flexible pipe connected to Eductor.

### **3.51 ENGINE SHUT DOWN AUTOMATICALLY:**

1. Turbo clutch failure.
2. OST Tripping.
3. Fuel pump not working properly.
4. Low water.
5. Low crank case vacuum.
6. Low lube oil pressure.
7. Defective lube oil pumps (Main).
8. No Fuel in fuel tank.
9. Defective Turbo.
10. Defective Governor lube oil sensing pipe.
11. Injector rack stuck up.
12. Defective Governor.

### **3.52 PISTON CRACK**

1. Improper alignment of piston cooling pipe.
2. Defective piston cooling pipe.
3. Wrong Exhaust valve timing.
4. Reverse fitment of piston carrier.
5. Improper fitment of piston holding tool during maintenance.
6. Defective piston cooling pump.
7. Blocked piston cooling oil manifold.

### **3.53 BLACK THICK SMOKE FROM TURBO**

1. Chocked air filters.
2. Defective clutch.
3. Turbo air inlet rubber boot worked out and blocking the turbo air inlet passage.
4. Defective injectors.

5. Improper supply of fuel oil.
6. Turbo malfunctions.
7. Improper adjustment of rack
8. Malfunction of Governor.
9. Slippage of injector linkage.

### **3.54 OSTA TRIPPING:**

1. Improper adjustment of OSTA
2. Injector struck up.
3. Defective OSTA assembly and linkages.
4. Improper adjustment of fuel rack.

### **3.55 OSTA NOT TRIPPING**

1. Improper adjustment of tripping pawl.
2. Stuck up throw weight.
3. Defective OSTA trip lever.

### **3.56 OSTA NOT RESETTING:**

1. Defective OSTA trip lever key.
2. Defective OSTA lock.
3. Defective OSTA linkages.
4. OSTA trip pawl defective.

### **3.57 FUEL HEADER VIBRATION :**

1. Cam gear vibration.
2. Faulty injectors.
3. Improper engine timing.
4. Improper rack setting.
5. Improper fitment of counter weights (OSTA+cam gear end).
6. Improper Engine alignment & compressor alignment.
7. Cam shaft breakage.
8. Gear train components failure.
9. Slack Engine foundation bolts.
10. Defective power assemblies.

### **3.58 HIGH LUBE OIL CONSUMPTION**

1. External leakages.
2. Engine additional drain dummy leakage.
3. Leakage in lube oil drain pipe.
4. Worn out piston rings & valve guides.
5. Main lube oil header leakage.
6. Engine block leakage.
7. Sump covers leakage.

### **3.59 LUBE OIL LEAKAGE FROM AIR BOX DRAIN PIPE**

1. Punctured air box drain pipe in sump.
2. Main lube oil header crack.
3. Worn out piston rings.

### **3.60 WATER LEAKAGE FROM AIR BOX DRAIN PIPE :**

1. Defective water inlet tube.
2. After cooler tube leakage.
3. Head to liner gasket & joint leakage.
4. Damaged power assembly.
5. Improper fitment of water inlet tube.

### **3.61 OIL THROW FROM TURBO**

1. Damaged power assembly.
2. Damaged valve guide.
3. Low crank case vacuum.
4. Clogged eductor.
5. Oil separator oil collecting wire meshes missing.
6. Improper fitment of piston rings, head seat ring (worn out).

### **3.62 WATER THROW FROM TURBO :**

1. Cylinder Head crack.
2. Head to Liner gasket leaking.

**3.63 CRANK SHAFT NOT ROTATING:**

1. Obstruction to the movement of crank shaft due to external materials.
2. Defective power assembly.
3. Improper Exhaust valve timing.
4. Defective gear train components.
5. Hydraulic locking of power assembly due to any water/oil collected on piston crown.
6. Defective turbocharger.

**3.64 LOSS OF HORSE POWER :**

1. Clogged air filters.
2. Stuck up injectors.
3. Improper adjustment of fuel racks.
4. Blocking of air inlet duct.
5. Exhaust manifold expansion joint puncture.
6. Malfunction of Governor.
7. Defective clutch.
8. Defective fuel return relief valve 15 psi.
9. Defective Turbo.
10. Improper supply of air.
11. High engine temperature due to fans not working.
12. Insufficient supply of fuel.
13. OSTA pawl stuck in tripped condition.

**3.65 ENGINE HUNTING IN LOAD TEST – 2 CONDITION AND RACK LENGTH ABOVE 0.82 :**

1. Improper setting of Governor.
2. Low engine output.

**3.66 ENGINE IS CRANKING IN COLD CONDITION. BUT ENGINE RPM IS LESS AND NOT HOLDING :**

1. Improper adjustment of Governor Compensation needle valve.
2. Worn out Teflon seal of power piston.

### **3.67 LR% IS NOT MATCHING IN HIGHER NOTCHES :**

1. Choked Baggie filters.
2. Rack demand; (Ensure rack position shall be corresponding to the request of Governor).
3. Exhaust manifold leakage.
4. Boost air pipe connection to Governor may be broken/ disconnected.
5. Defective Fuel injector (will be known by measuring individual cylinder exhaust temperature).
6. Injector rocker arm for free movement & ensure OSTA trip pawl is not obstructing the rocker arm movement & timing of the injector.
7. Defective governor setting.
8. Defective fuel relief 15 psi return side valve.

### **3.68 ABRUPT INCREASE IN ENGINE SPEED BEFORE GETTING STABILISED AS AND WHEN ENGINE IS NOTCHED UP/DOWN:**

1. Defective buffer piston spring & buffer piston of the governor.
2. Sluggish movement of the injector rack.

### **3.69 IF THE LR% IS LESS IN ALL NOTCHES:**

1. Select load test mode in EM 2000 & remove AMPHENOL plug, then check the LR% if it is less than 100%, it is due the electrical problem.
2. Ensure proper functioning of the booster air pressure. As the notch varies, sensor piston position also varies. It should not stuck up.

### **3.70 RPM DROPPING IN LOAD :**

1. Ensure the LR scale of the Governor is activating. If it is activated, ensure the LR reading in EM 2000 as well as in Governor LR scale should be same. If not, it is the probe of resistor pack of the Governor or Electrical connections connecting the 'AMPHENOL' plug.

### **3.71 BUBBLES AT RETURN SIGHT GLASS :**

1. Leakage in the suction pipeline or injector.

### **3.72 BUBBLES AT 8TH NOTCH ONLY IN RETURN SIGHTGLASS:**

1. Suction pipe adapter & pipeline leakage.
2. Leakage in the injector.

### **3.73 BUBBLES AT RETURN RIGHT GLASS AFTER 3RD OR 4TH NOTCH :**

1. Less Fuel pump pressure (25 to 32 psi)
2. Any foreign material in suction strainer and in fuel tank suction pipe.
3. Condition of the primary filter drain cock. It should always be in closed condition.

#### **NOTE : FINDING OUT OF LEAKY/DEFECTIVE INJECTOR :**

1. By closing the rack of individual injector under engine in idle condition, the bubbles in the return sight glass used to disappear for that particular injector.
2. Check exhaust temperature at exhaust manifold raises.
3. By opening test plugs individually under engine idle condition & check for white smoke through the test plug.

### 3.74 MR PRESSURE DROPPING ON RUN & PCS OPENING

1. Check for continuous operation of Sanders, Horn, ABD Valve, MVCC, Radar- Air Blast etc.,
2. Conduct MR efficiency test.
3. Check for correct operation of Air Dryer.
4. Check correct operation of EBT, Sander, MVCC.

### 3.75 MR PRESSURE DROPPING

When MR Pressure is dropping rapidly on loco with formation attached (observe flow indicator). Close the BP angle COC of loco and check the MR pressure. If MR pressure is building up and loading/unloading is taking place in idle, formation leakage to be checked.

Note: In case of train of twin pipe - Close FP first ensure AFI indication for BP leakage.

#### - CHECK AIR DRYER OPERATION

- a. If Air dryer towers (i.e., inside and outside) blowing continuously switch off air dryer breaker.
- b. After switching off air dryer CB even then air is blowing continuously then shut down the engine by securing hand brake and providing wheel skids. Drain MR completely to dummy the purge valve (on tower) by providing 2 Rupee coin for the tower which is blowing continuously.
- c. If Pre-coalescer drain valve blowing continuously switch off air dryer CB.

Note: If Air dryer function is isolated for malfunction. Additional care to be taken to drain moisture from ABD valves periodically. Before draining MR

completely, air brake circuit breaker to be put off while re-cranking when MR full then put 'ON'.

- **CHECK AUTOMATIC BLOW DOWN VALVE FUNCTION**

Check the proper function of MR1, MR2, ABD valves.

If any one of the valves operating for longer time, close the defective (i.e, brass spindle 'IN' only) ABD Valve from AUTO position to OFF position.

- **CHECK THE EM 2000 MR PRESSURE ON DISPLAY / MR GAUGES**

a. Check the MR Pressure in EM 2000 Screen and MR gauge in control stands. If both reading are shown more than 4 to 5 kg/cm<sup>2</sup> difference, it indicates defective MRPT or choked pipelines connected to MRPT. (ensure eng. RPM increasing properly for air comp. operation)

b. MRPT is located inside ECC3 compartment. Close the MRPT COC and drain the moisture from test plug duly pressing. Open the MRPT COC for normal operation which is provided in compressor room behind ECC3 cabinet.

- **DEFECTIVE MVCC VALVE**

a. Magnet Valve of compressor control (MVCC) is located inside compressor compartment mounted on unloader panel. It controls the compressor loading and unloading cycle according to EM 2000 commands through DIO.

b. If MVCC valve stem has stuck up, MR pressure continuously act on unloader assembly and compressor will go on unloading the compressor causing low MR pressure even though MVCC is in de-energize condition.

- c. Press the MVCC valve 'T' handle 3 to 4 times which is located in MVCC (over riding manual handle.)
- d. If MVCC is not having 'T' handle, close the MR 'J' filter COC, drain the trapped pressure and dose. Ensure MR safety valve blowing. If not, defect still existing because of comp. valves or pipeline leakage.

## - DEFECTIVE LP SUCTION VALVE

- a. Check unusual sound from compressor LP (Low Pressure) suction valves. If unusual sound is observed from LP suction valve, it indicates suction valves are defective.
- b. Conduct MR Efficiency Test.
  - i. Engine to be kept in Load Test mode (i.e., 8th notch).
  - ii. 7.14 mm orifice choke to be provided in MR2 'J' filter and open 'J' filter COC fully.
  - iii. MR pressure should maintain a min of 136 PSI or normal loading & unloading should take place
  - iv. If MR Pressure is dropping below 7 kg/cm<sup>2</sup> it indicates LP suction valves are defective, renew suction valves.

## 3.76 BRAKE PIPE (BP) PRESSURE NOT CREATING

### 1. ON RUN BP PRESSURE DROPPED :

- a Check the air flow indicator, if flow indicator shoots up, it indicates BP pressure leaking on formation, (Chain pulling or parting between coaches/wagons).
- b. Check crew message.

- c. If EM 2000 displays penalty, keep auto handle(A9) in FS for 10 seconds. (OR) emergency for 60 seconds according to EM 2000 request.
- d. After penalty time is over, and still BP pressure not restored, keep L/T switch in trail then after 10 seconds again keep in lead if problem still exist then recycle the MAB circuit breaker for 20 seconds.
- e. Even after recycling the breaker also, BP is not building, conduct Air brake self test.
- f. If self test also failed, Open the CCB compartment and check the fault code on the CCB that is displayed.
- g. If the fault code is displayed 60 or 70 series put off MAB CB in control panel & gently press Air Brake computer modules, i.e., EPA1, EPA2, EPA3, and CPZ face connectors.
- h. Check the BCEV connector tightness.
- i. Close the formation BP angle COC and check the BP gauge and air flow indicator in loco, if it is showing 5.2 and 0 respectively, It indicates formation leakages.
- j. After checking BCEV connector tightness and AB modules put on MAB breaker and once again conduct air brake self test.
- k. If air brake self test passed, restore BP and work.

## **2. HORN & SANDER WORKING CONTINUOUSLY**

- i. If Horn blowing continuously close MR1 filter COC & drain the Trapped pressure and open the COC duly closing drain COC of J filter.
- ii. If Sanders working continuously, follow the above same procedure used for horn.
- iii. Check whether Electrical switches are in pressed/ struck up position.

## OUR OBJECTIVE

To upgrade maintenance technologies and methodologies and achieve improvement in productivity and performance of all Railway assets and man power which inter-alia would cover reliability, availability, utilization and efficiency.

If you have any suggestions and any specific comments, please write to us.

Contact person : Director (Mech.)

Postal address : Indian Railways,  
Centre for Advanced  
Maintenance Technology,  
Maharajpur, Gwalior.  
Pin code - 474 0050

Phone : 0751- 470890, 0751-470803

Fax : 0751- 470841