Chapter 2 Fault Analysis and Locating

2.1 Conventional Fault Handling Process and Method

2.1.1 Classification of Faults

Faults can be classified into three categories according to their sources:

- Faults with BTS equipment
- Faults with data configuration
- Faults with other Network Elements (NE) like MS, BSC, or cells of other BTSs.

Generally, faults can be reported by:

- The alarm system. The alarm system will send out signal whenever it detects a fault, and recommend relevant resolution.
- MS Subscribers. Sometimes, poor service or performance is also a form of fault. For instance, poor conversation quality, MS access failure.
- Maintenance & Operation Engineer. In some case, fault might happen while loading data or sending commands.

2.1.2 General Handling Procedure

The fault handling process involves four stages: Information collection, fault judgment, fault location, and troubleshooting.

- Information collection: Collect all available original information
- Fault judgment: Specify the fault range
- Fault location: Locate the specific fault cause
- Troubleshooting: Eliminate faults and restore the system through proper measures or steps

2.1.3 Conventional Methods for Fault Judgment and Location

I. Original information analysis

The original information includes abnormal phenomenon reported by Maintenance & Operation Engineers, users or offices. It provides first-hand materials for fault judgment and analysis. Thus it helps engineers minimize the fault range and locate fault type.

II. Alarm information analysis

The alarm system of the BTS will send out signals in the form of sound, light, LED and screen output. This information, shown in the Alarm Maintenance Console, includes detailed description for fault, possible cause and recommended solution. The faults identified by alarm system range from hardware, link and trunk to CPU load. Hence, the alarm system is a very useful tool for engineers to locate and solve faults.

Alarm information analysis can help locate the specific location and cause of the fault. The rich and complete alarm information from the BSS alarm console can be used to locate a fault directly or in cooperation with other methods. It is the major method for fault analyzing.

III. Indicator status analysis

On the maintenance window of BTS modules, there are indicators to reflect statuses of boards, circuits, links and nodes. Hints given by indicators often help engineer to locate faults quickly. Generally, this method is applied together with alarm information.

IV. MS dialing test

In most cases, BTS functions affect the quality of voice and data services. It is a straightforward method to verify calling function and BTS modules via MS dialing test. This method is frequently used to verify signaling system, voice and data transmission.

V. Instruments and meters

It is a conventional technical method for BTS fault handling to analyze fault through instruments and meters. Instruments and meters can provide visualized and quantized data to directly reflect the fault nature. This method is widely applied in signaling analysis, wave shape analysis, BER detection and feeder fault detection

VI. Traffic measurement

Call completion rate, a key indicator for measuring capability of telecom operators, directly relates to profits of operators and their customer satisfaction. Therefore, it is critically important for operators to increase call completion rate and minimize call loss.

Traffic measurement is a powerful tool to enhance call completion rate by detecting cause for call loss. Faults with BTS are also direct causes that affect call completion rate.

VII. Interface tracing

The BSS O&M system can trace messages of Abis interface, OML interface, Um interface and A interface on the real-time basis.

This function provides a very efficient approach for identifying faults occurred in call connection or BTS-BSC signaling interworking. Given this information, engineers can easily locate root cause and figure out follow-up actions.

VIII. Loopback test

Loopback test is a common approach to verify normal functioning of transmission equipment and trunk parameter setting. Loopback test is a kind of self-sending and self-receiving method. By performing this test, engineers are able to check transmission equipment, channel, service status, and signaling interworking.

Two loopback modes are available: Software loopback and hardware loopback. The former is easier to perform and more flexible but less reliable than the latter.

Conventional loopback tests are E1 loopback test and optical fiber loopback test.

🕮 **Note:**

When E1 outloop test is activated on the BSC side, the time parameter is mandatory. Otherwise the BTS will be kept in the disconnected status all the time unless the BTS is reset on the site.

IX. Contrast/Conversion

In the contrast mode, the user can compare the faulty part or phenomenon with the normal part or phenomenon so as to detect the dissimilarity and locate the fault. This method can be used in simple fault cases.

After spare parts are used, the fault range or location still cannot be specified. In this case, the user can interchange the normal parts like boards or fiber with the possible faulty parts, and then detect the change on operation status. In this way, the fault range or fault location can be detected. This method can be used in cases with complex fault ranges.

Note:

Interchanging is a risky operation. For example: A board in short-circuit status, if interchanged to a normal subrack, may damage the normal subrack. Therefore, the use of this method is requires great care. Do not use it unless you are sure that it will not cause new faults

X. Getting help on Huawei technical support website

Users can login Huawei's technical support website support@huawei.com for help. This website collects a large number of cases for all product lines, and shares our experience in specific fault location and solving.

Registration is needed before you can use these information. After login with your user name and password, you can search the information of your interest. For example, input [Maintenance experience], [Mobile Telecommunication] and [CDMA] to search the related fault cases.

In addition, you can enter the [Technical Forum] of support@huawei.com to search related problems or post your questions for solution.

XI. Contacting Huawei local office

If you cannot locate or solve the fault, you can contact Huawei local office or contact Huawei headquarters.

Within the warranty period, Huawei provides the following services: Telephone consultation, telephone instruction, remote dial-up diagnosis, on-the-site support, hardware maintenance, complaint handling, on-the-site training and regional manager service.

Contact information of Huawei Customer Service Center

Hotline: 86-755-28560000 8008302118

Fax: 86-755-28560111

E-mail: support@huawei.com

E-mail of technical support network administrator: supportmaster@huawei.com

2.2 Typical Case Analysis

This part shares with you some typical cases our customer met, together with relevant resolution, in their maintenance and operation process. It is expected to give you some hint in solving the problem you encounter. Four cases are presented

hereinafter: software download fault, initialization failure, coverage fault and module fault.

2.2.1 Software Download Fault

I. Fault Description

Software download faults include software download failure, maintenance console prompting failure or the failure of generating correct prompt information. For ODU3601C, the software to be downloaded is the software of Micro-bts transceiver Module (MTRM).

II. Troubleshooting

Software download failure may be caused by the following two factors: The failure of downloading software to the upper-level BTS and the file loading operation abnormally terminated by the board

- Failure of downloading software to upper-level BTS

1) Check whether the OMU BOOTP of the upper-level BTS is normal

The BOOTP failure may be caused by a blocked link, incorrect route or configuration errors, etc. These causes should be analyzed one by one to eliminate the faults.

2) Check whether the FTP server in BAM is configured correctly.

The FTP server configuration includes the following four items: user name, password, user access path and access authority. Incorrect configuration of any of these four items may lead to user login failure and software loading failure.

Related details are available in the "BTS Maintenance" module of the user manual of the upper-level BTS.

- File loading terminated abnormally by board

All files should carry a correct file header in the specific format as required. The file ID and file version in the header should match that in the activation commands released by the OMC, otherwise the board may consider the software to be downloaded is not what is expected and thus prompt exceptional errors.

2.2.2 Initialization Failure

I. Fault Description

When the ODU3601C is powered on, the system initialization aborts, which leads to the BTS start-up failure.

Upon this failure, the ACT indicator of MTRM keeps flashing fast.

II. Troubleshooting

The ODU3601C initialization faults can be located through the following methods. Otherwise, please refer to the "BTS Maintenance" module of the user manual of the upper-level BTS.

- Incorrect BTRM data configuration

BTRM data configuration error may also lead to the BTS initialization failure, thus we need to carefully check all the parameters, such as the board ID, cell ID, cell resource pool ID and optical interface ID, etc. Reconfigure those parameters if necessary.

- Incorrect physical board connection

Eliminate the fault according to the following two cases:

- The boards or modules are not installed properly and need to be corrected;

- Fiber connection fault exists between the upper-level BTS and the MTRM of ODU3601C. Please refer to the "BTS Maintenance" module of the user manual of the upper-level BTS.

2.2.3 Coverage Fault

I. Fault Description

The downlink coverage scope decreases while the receiving signal fluctuation of the mobile station increases.

II. Troubleshooting

In the case of coverage fault, please eliminate the system's antenna feeder fault and RF module fault first, and then eliminate the effect from external interference sources.

1) Check antenna & feeder system

Check with sitemaster whether the Voltage Standing Wave Ratio (VSWR) is normal (VSWR should be less than 1.5 for BTS installation). If abnormal, check VSWR (less than 1.5) step by step from the antenna port of MFEM to the antenna of BTS, and check the transmit power (including testing the transmit power at the coupling-output port of MFEM). Check whether the connectors are installed correctly and tightly and check the seals. Check the following cases to eliminate faults

- Water infiltration in the antenna feeder system;
- Antenna, feeder and jumper damaged;
- BTS antenna and jumper disconnected or in poor contact;
- The feeder and jumper are disconnected or in poor contact;
- The jumper and MFEM are disconnected or in poor contact;
- The feeder and jumper connector are not installed correctly.

2) Check RF channel

Test the output downlink power at the feeder port of ODU3601C. If the difference between the down link power and the nominal power of BTS is too large, the fault should exist with the RF downlink channel. In this case, please check the following items in sequence: MTRM, MPAM, MFEM. Then check whether the inter-module RF jumpers are normal, and whether water infiltrates into the connectors.

2.2.4 Module Fault

I. Fault Description

ODU3601C has four modules: MAPM, MTRM, MFEM and MPAM. Module faults include:

- Alarm module fault;
- Fault of the upper-level board or module of the alarm module;
- Poor contact of the module and slot;
- Backplane fault.

II. Troubleshooting

- Eliminate MAPM Fault

Follow the handling process below. Go to next step if the problem cannot be solved with the current one:

1) When the external power supply fault is eliminated, MAPM input becomes abnormal.
2) Reset this MAPM.
3) Replace the MAPM.

- Eliminate MTRM Fault

Follow the handling process below. Go to next step if the problem cannot be solved with the current one:

1) If the problem is caused by the external interference, nothing needs to be done to the BTS, but try to reduce the external interference.
2) Check whether MTRM is in poor contact with the slot;
3) Eliminate antenna feeder system fault.
4) Eliminate the corresponding upper-level BTS fault.
5) Eliminate the fiber fault between BTS and the upper-level BTS.
6) Reset this MTRM.
7) Replace this BTRM.

- Eliminate Fault of Other Module

Check whether poor contact exists between other modules and slots. Replace MFEM and MPAM directly if it is faulty.