

## Radio Repair Management PAE Transmitter Frequency 133.2 Mhz Sibiru-Biru


Muhammad Caesar Akbar<sup>1</sup>, Ludfia Anggi Safitri Sinaga<sup>2</sup>

<sup>1,2</sup>Telecommunication and Air Navigation Engineering Study Program, Politeknik Penerbangan Medan

### ABSTRACT

The use of VHF Air to Ground (VHF A/G) radio equipment as a means of communication between the Air Traffic Controller (ATC) Tower and the aircraft must be guaranteed to be available. To serve the communication needs in the Jakarta Air Traffic Service (JATSC) area, it is necessary to place VHF radios in several locations called VHF Extended Range (VHF-ER). In the VHF-ER system, the information signal from the VHF radio is transmitted through the Very Small Aperture Terminal (VSAT) transmission line. In this report, the problem of TX VHF-ER Radio that cannot be used to communicate is discussed. Where on the Radio there is a menu that affects the running of communication, namely the polarities menu. In this menu, there are values that must be adjusted so that communication can run smoothly, namely 14V, 0V, and -14V. When it cannot be used to communicate, the value on the menu is 14, then it is lowered to -14 while checking the power supply, interconnection and cable jumpers on the serial and LAN ports.

**Keyword : VHF-ER; Radio Communication; VHF-A/G; VSAT; Polarities**

 This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.

#### Corresponding Author:

Muhammad Caesar Akbar,  
Politeknik Penerbangan Medan  
Jl. Penerbangan No.85, Medan, Indonesia.  
Email : mhdcaesar@poltekbangmedan.ac.id

#### Article history:

Received Jun 11, 2024  
Revised Jun 18, 2024  
Accepted Jun 25, 2024

## 1. INTRODUCTION

Perum LPPNPI is a State-Owned Enterprise (BUMN) that provides flight navigation services in Indonesia. Perum LPPNPI or known as AirNav Indonesia is engaged in the aviation sector which is an Aviation Navigation Service Provider with international standards that prioritize flight safety. Perum LPPNPI is a management and maintenance company for Air Navigation equipment at Kualanamu International Airport which was handed over to Perum LPPNPI Medan Branch Office under the guidance of the Ministry of SOEs as an operational supervisor and the Ministry of Transportation as a technical supervisor.

At Perum LPPNPI Medan Branch Office. There is a way to work and improve various communication equipment, namely AMSC, VHF A/G, VHF-ER, ATIS, Recorder and Dittel Portable, navigation, namely DVOR, DME and ILS, air traffic observation (surveillance), and automation (automation). This is needed to achieve the competence of Human Resources in the field of aviation that is competent, professional and globally competitive. On the Communication equipment, namely the Very High Frequency Extended Range right on Thursday, October 13, 2023 at 09.00 WIB (00.30 UTC) while carrying out flight communication procedures, there was a report from the JATSC Air Traffic Controller (ATC) conveyed to the JATSC Technician and then the JATSC Technician informed the Medan Technician that the TX VHF ER JATSC SiBiru-Biru frequency 133.2 Mhz Radio could not be used to communicate. This is due to the radio condition of the indicator pressed continuously."

## 2. LETERATURE REVIEW

### VHF A/G (AIR TO GROUND)

VHF Air To Ground Communication (VHF A/G) is a ground-to-air or vice versa flight communication equipment, which uses VHF frequencies and is typically used by ATS (*Air Traffic Service*) in guiding flight traffic(Liaison 2007). The VHF A/G beam is a line of sight with an average altitude of 6000 feet, it can only reach 100NM. This resulted in blanks in some areas of the corridor after 100NM.

The following is the division of flight traffic service units:

1) *Aerodrome Flight Information Service* (AFIS)

A service that provides information to aircraft that will depart or arrive at the airport. Such information includes weather conditions, navigation equipment, airports, the presence or absence of other aircraft operating at the airport, and matters that may endanger aircraft operating at the airport.

2) *Aerodrome Control Tower* (ADC) An aviation unit that provides aviation traffic services that is responsible for controlling the airspace at airports, including aircraft landing and take-off services. The ADC's working area is an area where an air traffic controller can visually see arrivals and departures, which means an air traffic controller can visually see the movement of aircraft from the top of the tower. Generally up to an altitude of 10,000 feet. With an area of 5 NM from the airport.

3) *Approach Control* (APP) An aviation traffic service unit that provides approach area control services. APP's work area is tasked with providing clearance for aircraft to enter the ACC work area and providing a path for aircraft that will enter its territory. In some areas of APP in Indonesia, APP's work units have used radar as an auxiliary facility in regulating aircraft movements. APP's working area in Indonesia (as stated by ICAO) is in the range of 10,000 feet to 17,000 feet with an area of 25-30 NM.

4) *Area Control Center* (ACC) An aviation traffic service unit that provides *en-route area* control services. The ACC work area is tasked with providing clearance for aircraft to enter the ACC work area in the vicinity as well as providing a path for aircraft that will enter its territory. In Indonesia, the ACC area consists of 2 ACCs (ACC Jakarta and ACC Makassar), the ACC work unit uses radar as an auxiliary facility in regulating aircraft movements. ACC's working area in Indonesia (as per the ICAO declare) is in the range of 17,000 feet to 24,000 feet.

#### **VHF ER (Extended Range)**

VHF ER is a VHF facility that is installed in a position far from the aviation traffic service unit in order to expand the coverage of the control area, usually for ACC (Area Control Center) units. VHF ER has a function to meet the needs of ACC services which have a very wide area of responsibility, so in several places this VHF ER equipment is installed. Transmitters, receivers are installed with high antennas or placed in mountainous or highland areas. Furthermore, a radio station was built for the placement of the equipment, so that it could reach a very wide area.

#### **VSAT (Very Small Apatured Terminal)**

VSAT is a signal receiving station from a satellite with a saucer-shaped receiving antenna with a diameter of less than 3 meters. VSAT is also a transmission facility where the transmitter and receiver are at different frequencies so that communication can take place in full duplex using satellite media. VSAT is a small satellite transceiver device for reliable data, voice and fax communication between several geographically dispersed earth stations.

#### **POLARITIES**

Inside the Radio there are *polarities*. *Polarities* are a number of indication and remote control signals that can be wired to a transmitter. These signals include transmitter ready indication, E-BIT input, PTT control signal, PTT control signal, PTT exit indication, transmitter inhibitor control signal, BIT test initiation control signal, external VSWR fault indication and C/O antenna. The PTT ref can be set to +14 volts, 0 volts, and -14 volts. The polarity value changes due to an unstable voltage entering the radio indicator, which is in the form of DC voltage.

### **3. RESEARCH METHOD**

The data collection technique is carried out using case studies, namely by including observations, by producing detailed descriptive data that is unique to the case studied. The case study method is carried out by digging up information that can be learned from the case of repairing radio transmitters taken from research conducted by the observation method, namely visiting to investigate, analyze, and consider various factors and components that may affect each other. With the observation method, the author can evaluate and get the results of the observation on the object. Then, the measurement method

is to obtain value data that affects the repair process of the 133.2 MHz frequency radio transmitter. Furthermore, the interview method is carried out to collect data directly by asking the parties concerned and understanding how the process of repairing the 133.2 MHz frequency radio transmitter. The initial stage carried out for data collection and observation is to check the conditions that occur on the radio transmitter with a frequency of 133.2 MHz. Next, voltage measurements are made on the radio that will affect communication on the radio. Next, data analysis was carried out. Calculation analysis was carried out using the data obtained to make improvements to the radio transmitter in accordance with the PAE module, which is -14 volts.

## 4. RESULTS AND DISCUSSION

### a. Problem Analysis

The TX VHF ER JATSC radio in SiBiru-Biru frequency 133.2 Mhz cannot be used to communicate. checks were carried out directly to the ER (SiBiru-Biru) location. Found radio Tx condition indicator pressed continuously. The function of the TX VHF ER Radio is to communicate between ATC JATSC and PILOT. This VHF ER is located in two locations, namely in SiBiru-Biru and Sidikalang. The VHF ER in Sidikalang functions to reach hilly areas, while the one in SiBiru-Biru functions to reach a blank spot. Since TX1 cannot be used to communicate, ATC JATSC uses TX2 instead. The following analysis was carried out:

- 1) On October 13, 2023, at 09.00 WIB, the technician checked the TX VHF-ER JATSC Radio with a frequency of 133.2 MHz in SiBiru-Biru and it turned out that the radio indicator was pressed continuously.
- 2) Perform a physical check on the radio. The results found that the radio was in a live position but could not be used to communicate.
- 3) Check for damage to LA PORT that causes the siBiru-Biru and JATSC networks to not connect.
- 4) The condition of the TX1 indicator pressed continuously (continues to emit) so that it is changed over to TX2, but TX2 is also affected by interference in the emission from TX1 because the condition of the TX1 radio is still on. TX1 is completely shut down and TX2 can be used instead to communicate.
- 5) After analysis and checking, then bring the TX Radio module to the CNSA Perum LPPNPI Medan Branch Office for further analysis.

### b. Problem Solving

- 1) Perform a physical radio check and the results are normal.

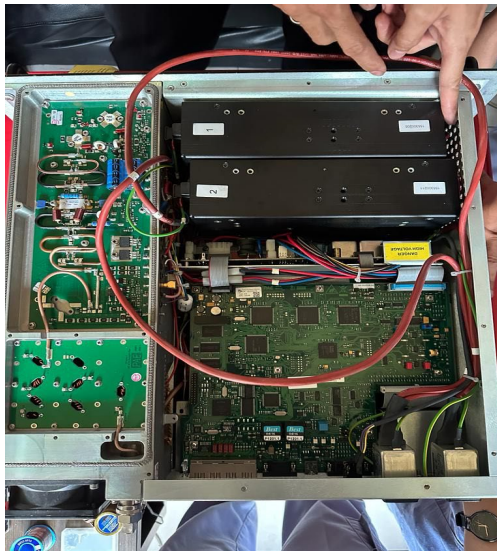


Figure 1. TX Radio Module Condition

2) Check the power supply and the results are not normal.

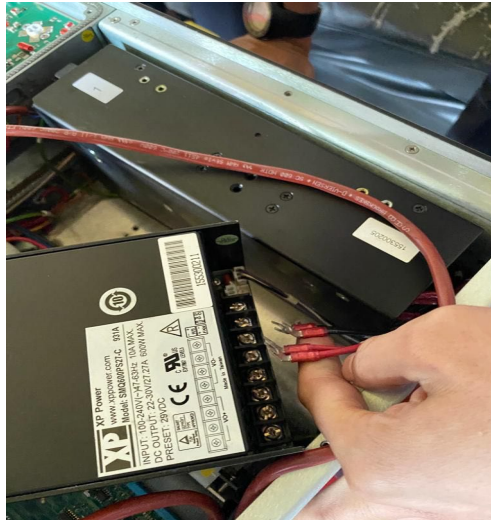


Figure 2. Checking the Power Supply

3) Checking the interconnection and the results are not normal.

4) Checking the parameter menu and PTT test, it was found that the voltage was 14 volts and the results were still flashing.



Figure 3. Voltage 14 Volt jumping condition

5) Perform voltage changes on the parameter menu.

a. Select *settings*, then click the *scroll button*

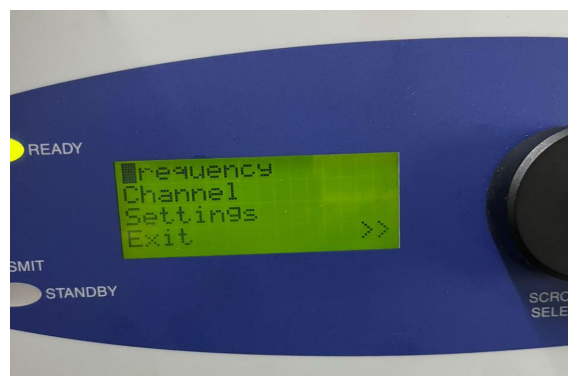


Figure 4. Settings menu display

b. On the Polarities menu in the click, after selecting the polarities the technician opens the PAE module to find out what value clues will be set. On the PAE module page 23 there is a table 6 Polarity Settings which explains and gives instructions for PTT Ref to be set to +14 Volts, 0 Volts, or -14 Volts.



Figure 5. Polarities menu display

c. Because it is still a jumping condition, try again to change the voltage, select PTT Ref 0V, PTT in STD then activate PTT locally activate PTT remotely (external port) the result is local normal and the remote is abnormal.



Figure 6. 0 volt voltage PTT Ref display

d. For the next last try by changing the voltage of -14 volts, select PTT Ref -14V, PTT in STD activate PTT locally and then activate PTT remotely (external port) the result is local normal and remote normal.



Figure 7. Display PTT Ref voltage -14 volts

6) Test using external ports (LAN port marc audio and serial port marc), by doing a cable jumper on the PTT pin on the serial and lan ports, which is already known from the manual book, for serial on pin 1 and pin 4 and LAN on pin 6 and pin 7 the results are normal.

7) Measuring the power output of Radio TX using a wattage meter and 250 elements, 10.Result: - forward power = 45 watts



Figure 9. Forward power value measurement with element 250

- reverse power = 0.1 watts



Figure 10. Measurement of reverse power value with element 10

Then the VSWR value is calculated: - VSWR Formula

$$VSWR = \frac{1 + \sqrt{\frac{P_r}{P_f}}}{1 - \sqrt{\frac{P_r}{P_f}}}$$

$$VSWR = 1 + \sqrt{0.1/45} / 1 - \sqrt{0.1/45} \quad VSWR = 1 + \sqrt{0.0023} / 1 - \sqrt{0.0023} \quad VSWR = 1 + 0.0479 / 1 - 0.0479 \quad VSWR = 1.0479 / 0.954 \quad VSWR = 1.1$$

The result is a normal VSWR.

After the VHF ER SiBiru-Biru Radio module was repaired and during the local test, the Tx radio condition had returned to normal, then the module was installed to siBiru-Biru. Radios can be reused to communicate

## 5. CONCLUSION

The problem that causes the VHF-ER Jatsc SiBiru-Biru Radio Transmitter with a frequency of 133.2 Mhz cannot be used to communicate because the radio indicator is pressed continuously. This is what caused damage to the Tx VHF ER radio. Therefore, a check was carried out with a PTT set and then a cable jumper on the PTT pin on the short serial and the result was normal. And the setting is carried out by lowering the polarities value, the results are normal. After it is repaired, it is then installed in the SiBiru-Biru shelter and the radio can be reused to communicate.

## REFERENCES

- Asri, Adisty Hanny, and Lita Lidyawati. 2018. "Performance Analysis of VHF-A/G Tower/ADC with VHF-A/G App in Airports." 4(1):75-84.
- Guarango, Piedad Magali. 2012. "Snte-2012 Jakarta State Polytechnic." (8.5.2017):2003-5.
- Hakim, T. D., and A. Dimiyati. 2018. "BRISAT VSAT Network Performance Analysis Based on Delay, Packet Loss & Service Level." Scientific Journal of Electrocrisis 6(3):108-13.
- Judge, Teten Dian. 2020. ") of 1.5 watts and its bounce power (p. 8(2).
- General, Director, and Civil Aviation. 2015. "Considering: a. that in the Regulation of the Minister of Transportation Number PM 59 of 2015 concerning Criteria, Duties and Authorities."
- Kualanamu, Airport. 2023. "SOP MEDAN FINAL (ATTACHMENT 1-30) 14 September 2023."
- Muchtar, Husnibes, and Teguh Firmansyah. 2015. "Design and Simulation of Helix Antenna at 2.4 GHz Frequency." Electrum Journal 15(2):27-32.
- Nurahman, Arian. 2012. "Analysis of the Replacement of Aviation Communication Facilities in the Flight Information Region (FIR) The Perspective of the Analysis of the Replacement of Aviation Communication Facilities in the Flight Information Region (FIR)."
- Park Air System. n.d. "T6T VHF 50 W Transmitter."
- Transportation, Ministry. 2007. "KM No. 27 of 2005 concerning the Implementation of Indonesian National Standards (SNI) 03-7097-2005 CONCERNING VERY HIGH FREQUENCY AIR GROUND COMMUNICATION EQUIPMENT (VHF AIR GROUND) AT AIRPORTS AS A MANDATORY STANDARD."
- Pratama, Aswab Nanda. Galih, Bayu, ed. 2020. "RADIO."
- Wahyudi, Johan. 2017. "Technical Study of the Results of the Installation of VHF-ER Ground to Air." Aviation Technology 1(1):20-25.
- Yosef Rugi Laka, Germanus, Luci Kanti Rahayu, Yahdi Kusnadi, Nusa Mandiri Jl Kramat Raya No, Central Jakarta, and South Jakarta. 2015. "Gilat Modem at Pt. Indo Pratama Teleglobal Jakarta." XII(2): 167-78
- Airnav Indonesia, 2018."History of Perum LPPNPI" airnavindonesia.co.id.