

MODULE 33
TGC/ALC FAULT ISOLATION

OBJECTIVE

Given TO 31S1-2TSC60-12, isolate TGC/ALC faults IAW Table 5-31.

PREREQUISITES

1. Must complete Modules 1, 2, 3, 15, 20, 21, 25, and 29 thru 32.

2. Must be able to operate the following test equipment:

- a. HP-11005A Matching Transformer
- b. HP-204C Audio Oscillator
- c. HP-3400A True RMS Voltmeter
- d. Bird 43 Thru-Line Wattmeter

INFORMATION

The GRT-17 Transmitter has two circuits for gain control to ensure that the maximum power output is available without distortion: TGC (Transmit Gain Control) and ALC (Automatic Load Control). To determine if there is a problem with the adjustment or operation of these two circuits, you need to perform the power output vs. audio drive level test.

As you know, the output power in a single-sideband transmitter depends on the audio input. The louder you talk into the microphone, the more power the Transmitter produces

and vice versa. However, after a point you could overmodulate the final amplifier which causes distortion.

The ALC circuit prevents over-driving the final amplifier. After the output power reaches a set limit, a signal (ALC) is sent back to the Exciter telling it to turn its gain down a little.

The TGC circuit samples the output of the final amplifier and adjusts the gain of the amplifier during its tune cycle. Once the tune cycle is completed, the gain of the amplifier remains constant until another tune cycle is initiated. The gain of the amplifier and, therefore, the setting of the TGC circuit is discussed in Module 32.

In this test you will apply a tone to the input of the Transmitter and measure the output power as you vary the level of the tone. You should be able to see the output power remain constant at the proper level (2.4kW) as long as the tone level is above the interface level for your system. (See Module 10.)

As the level of the tone is dropped below the interface level, the output power of the Transmitter should also drop accordingly. If not, either adjustment or repair of the ALC circuits is indicated. Now look at Table 5-31 of the TO.

Step 1 is telling you to calibrate the output of the Audio Oscillator at 10dB above the interface level of your system. If you don't know the interface level of your system, now is the time to find out. Ask your trainer.

This step also tells you to connect a thru-line Wattmeter in line with the RF cable going to the dummy load. This may seem to be a duplication of effort since there is a

metering system built into the van. Which one of the two Wattmeters was calibrated by PMEL?

As a rule of thumb, when you are adjusting the equipment or checking the equipment to ensure it is within specifications, use test equipment that is calibrated by PMEL. If you are looking for relative indications and the accuracy of precision calibrated test equipment is not needed, you can use the system's built-in meters.

The equipment operation column is telling you to turn on the radio and set it for single-sideband operation. Next, you are to patch the Audio Oscillator into the attenuator and then patch the output of the attenuator into the Transmitter input.

The Power Amplifier should be adjusted so that any input above the interface level of the system is clamped by ALC to prevent the output of the amplifier from going above its limit (2.4kW). Any audio below the interface level should cause the output of the amplifier to be reduced.

Since you initially set the level of the Audio Oscillator to 10dB above the interface level, and the attenuator is set to 0 (no attenuation), the Power Amplifier input should be clamped by ALC and the output power should read 2.4kW.

By reducing the audio input to the Transmitter and observing the transmit power output, you should be able to find where the threshold of the ALC is set. That is, any audio above the threshold should cause ALC action, and any audio below the threshold should reduce the output of the Transmitter.

If you discover that the threshold of the ALC is above the interface level, ALC adjustment is required. If the threshold of the ALC is below the interface level by more than 3dB, adjustment will be required.

ADDITIONAL INSTRUCTIONS

Answer the following review questions and check your answers with the confirmation key. For each wrong answer, review the material in the module. Next, ask your trainer for the KEP questions. After your trainer checks your answers and reviews the questions you missed, go on to the performance procedures.

REVIEW QUESTIONS

1. Explain what effect the audio input level has on the power output of a single sideband Transmitter.
2. Explain the function and purpose of ALC.
3. Explain the purpose of the power out vs audio drive level performance test.
4. Explain the function of the TGC circuit in the Power Amplifier.

PERFORMANCE PROCEDURES

Have your trainer demonstrate the power-output vs drive level test. Then practice the procedures until you feel confident. Your trainer will annotate your training records when he/she feels you are proficient.