

## General Class License Manual - Supplemental Material

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The following text is presented on the *General Class License Manual* Web page as “Supplemental Material” intended to support or correct the 1<sup>st</sup> edition of the text. It is reproduced here for instructors and students to use independently from Web access.

### **Section III**

Regarding the FCC requirements for maintaining station information, the FCC rules explicitly require that written records be kept of the antenna gain of any antennas (other than a dipole) used on 60 meters. [§97.303(s)]

The requirement for recording control operators other than the licensee is implied. There is no rule that requires all licensees to keep a written record of all control operators. However, the FCC will assume the licensee was acting as control operator, unless there is written evidence to the contrary. In effect, a log of control operators is required for the FCC to correctly ascertain the identity of control operators.

The associated exam question on this topic (G2D07) has been withdrawn.

### **Section IV**

On page 4-2, next to the Ohm’s Law diagram, the formula  $P=I^2 \times I \times R$  should be  $P=I^2 \times R$ .

On page 4-15, the resistor values used in Example 15 should be 20  $\Omega$ , 50  $\Omega$ , and 75  $\Omega$ . The correct solutions are:

$$\text{Series } R_{\text{EQU}} = 20 + 50 + 75 \Omega = 145 \Omega$$

$$\text{Parallel } R_{\text{EQU}} = 1 / (1/20 + 1/50 + 1/75) = 12 \Omega$$

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The third paragraph of the section “Analog and Digital Integrated Circuits” (page 4-25) and question G7B02 appear to be at odds as to whether the binary values 0 and 1 correspond to a circuit’s ON and OFF states. The correct answer for G7B02 is (A), but the student should realize that this is a general statement about digital states being used to represent binary numbers. Digital circuits may use either “sense” of 0 and 1, depending on the type of circuit. In fact, 0 often represents an ON state and 1 an OFF state. There is no hard-and-fast rule about voltage, on/off, and 0/1. This is mentioned on page 4-27 in the third paragraph.

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The intent of the paragraph on page 4-25 is not to absolutely link 0 to OFF and 1 to ON. In fact, 0 often represents an ON state and 1 an OFF state. There is no hard-and-fast rule about voltage, on/off, and 0/1. This is mentioned on page 4-27 in the third paragraph.

On page 4-31, in Figure 4-25(D), the polarity of the secondary should be reversed to show the positive (+) sign at the bottom and the negative (-) sign at the top of the winding.

## Section V

The section numbers jump directly from 5.4 Transmitter Structure to 5.6 Receiver Structure. No material was omitted. This is just a missing section number.

The discussion on FM receiver architecture (page 5-19) refers to "IF amplifiers" and "limiter amplifiers". Figures 5-16 and 5-17 also show separate labels for "IF Amp" and "Limiter". This is confusing with regards to question G7A13 ("What type of circuit is used in many FM receivers to convert signals coming from the IF amplifier to audio?") Note that the same mixer-and-filter circuitry precedes both the IF Amp and limiter. Limiting for FM is performed at the same frequency as linear IF amplification for AM signals. A better explanation of the different receiver architectures would be that "...a *limiter* amplifier, a special, non-linear IF amplifier, replaces the linear IF amplifier in an AM receiver."

## Section VI

Table 6-1 Feedline Characteristics

The table printed in the 1st printing of the General Class License Manual is in error. The following table contains the correct typical loss data for several popular types of coaxial cable. Cable loss and other parameters such as velocity of propagation vary between manufacturers and sometimes from batch to batch. If you are using the cable in a way that depends on an exact value, measure the cable with test equipment. The values in the table below were calculated using the on-line calculator at Times-Microwave ([www.timesmicrowave.com/cgi-bin/calculate.pl](http://www.timesmicrowave.com/cgi-bin/calculate.pl)).

Cable Type	Impedance ( $\Omega$ )	Loss per 100 feet (in dB) at 30 MHz	Loss per 100 feet (in dB) at 150 MHz
RG-8	50	1.08	2.53
RG-8X	50	2.96	4.53
RG-58	50	2.47	5.63
RG-59	75	1.79	4.11
RG-174	50	4.56	10.3
RG-213	50	1.08	2.53
9913	50	0.68	1.58

## Section VII

The discussion on bending of radio waves in the ionosphere incorrectly uses the term “diffraction” where “refraction” should have been used.

## Section VIII

### Electrical Safety - Shock Hazards

There are several different standards for defining electrical shock hazards, depending on the environment in which the standard is applied. For example, current leakage standards in medical equipment are different than for home appliances and those standards are different than on-the-job industrial standards. The following table is from OSHA Publication 3075, "Controlling Electrical Hazards" (<http://www.osha.gov/Publications/3075.html>). Question G0B14 refers to 5 mA as the maximum harmless current and is in rough agreement with the table used in the *General Class License Manual*.

### Effects of Electric Current in the Human Body

Current	Reaction
Below 1 milliamperere	Generally not perceptible
1 milliamperere	Faint tingle
5 milliamperes	Slight shock felt; not painful but disturbing. Average individual can let go. Strong involuntary reactions can lead to other injuries.
6–25 milliamperes (women)	Painful shock, loss of muscular control*
9–30 milliamperes (men)	The freezing current or " let-go" range.* Individual cannot let go, but can be thrown away from the circuit if extensor muscles are stimulated.
50–150 milliamperes	Extreme pain, respiratory arrest, severe muscular contractions. Death is possible.
1,000–4,300 milliamperes	Rhythmic pumping action of the heart ceases. Muscular contraction and nerve damage occur; death likely.
10,000 milliamperes	Cardiac arrest, severe burns; death probable

\* If the extensor muscles are excited by the shock, the person may be thrown away from the power source.

Source: W.B. Kouwenhoven, " Human Safety and Electric Shock," Electrical Safety Practices, Monograph, 112, Instrument Society of America, p. 93. November 1968.

The Wikipedia article on electric shock ([http://en.wikipedia.org/wiki/Electric\\_shock](http://en.wikipedia.org/wiki/Electric_shock)) states, "A low-voltage (110 to 220 V), 50 or 60-Hz AC current travelling through the chest for a fraction of a second may induce ventricular fibrillation at currents as low as 60mA. With DC, 300 to 500 mA is required. If the current has a direct pathway to the heart (e.g., via a cardiac catheter or other kind of electrode), a much lower current of less than 1 mA, (AC or DC) can cause fibrillation. Fibrillations are usually lethal because all the heart muscle cells move independently. Above 200mA, muscle contractions are so strong that the heart muscles cannot move at all."

### **Question Pool Items**

G2D07 - This question is withdrawn.

G9C13 - The correct value for "C" is  $\frac{3}{4}$ , not  $\frac{1}{4}$ . The correct answer "A".