

**OUTLINE SHEET 3-15-1**

**Converters/Keyers**

A. INTRODUCTION

This lesson is designed to provide the trainee with the information necessary to setup and operate converter/keyer equipment in a shipboard communications environment..

B. ENABLING OBJECTIVES

**3.70 RECOGNIZE** basic converter/keyer fundamentals in accordance with the technical manual.

**3.71 IDENTIFY** general shipboard converter/keyer equipment in accordance with the technical manual.

**3.72 Recognize** AN/URA-17F/CV2460 set-up procedures in accordance with the technical manual.

**3.73 OPERATE** AN/URA-17F/CV-2460 converter/keyer in accordance with technical manual.

C. OUTLINE

1. Converter/Keyer Fundamentals
2. Common Shipboard converter/keyer
  - A. AN/URA-17F
  - B. CV-2460/SGC
3. Setup Procedures
  - A. AN/URA-17F
    - 1) Controls
    - 2) Procedures
  - B. CV-2460/SGC
    - 1) Controls
    - 2) Procedures

**ASSIGNMENT SHEET 3-15-2  
CONVERTERS/KEYERS****A. INTRODUCTION**

This assignment is to be completed prior to the material being covered in class.

**B. ENABLING OBJECTIVES**

Refer to enabling objective in Outline Sheet 3-15-1.

**C. STUDY ASSIGNMENT**

None

**D. STUDY QUESTIONS**

1. Audio (AF) is what type of signal?
2. Diversity operation requires how many inputs?
3. How does a converter choose between inputs when operating in diversity mode?
4. What is the most common shipboard converter/keyer?
5. What frequency band uses 500Hz/700Hz audio tones to modulate marks and spaces?
6. What is the maximum baud rate for the AN/URA-17F?
7. What mode should the Control switch on the AN/URA-17F be in for half duplex operation?
8. When operating a CV-2460/SGC in Freq Option A, audio tone represents a space and mark?
9. What position should the CV-2460/SGC mode switch be in for half duplex operation?
10. What is the problem with interoperability with the URA-17F and CV-2460 when both are using reverse keying?

## INFORMATION SHEET 3-15-3 CONVERTERS/KEYERS

### INTRODUCTION

This lesson is designed to provide the trainee with the information necessary to setup and operate converter/keyer equipment in a shipboard communications environment.

### REFERENCES

1. NAVSHIPS 0967-LP-340-0010 Technical Manual for Comparater-Converter Group AN/URA-17F
2. NAVELEX EE162-AB-MMO-010/E110 CV2460 Technical Manual for Telegraph-Telephone Signal Converter
3. NAVEDTRA 14088, Electronics Technician Volume 3 – Chap 2

### INFORMATION

#### 1. Converter/Keyer Fundamentals

Converters are used in Radio Activated TeleType (RATT) circuits to change signals from audio (sound) to Direct Current (DC). A receiver processes an incoming RATT signal (RF) and produces Audio Frequency (AF) tones. The AF then passes through an audio patch panel and on to the converter. The converter then converts the AF to DC marks and spaces. This is converting an analog signal (AF is analog) to a digital signal. This conversion is much like how a computer modem operates. You may even see technical manuals refer to converter/keyer's as modems.

Converters may operate in single or diversity mode. Single mode is pretty straightforward; a single audio signal is received and converted. In diversity mode, two audio signals are received simultaneously by two converters. The converters compare the signal strength and then convert only the strongest signal. The converter doesn't guarantee the best signal is used, only the strongest. Interference may actually be stronger than the desired signal.

There are two types of diversity operation, frequency and space. The source of the two audio signals will determine which type you are using. Frequency diversity requires two receivers on two different frequencies providing the audio to the converters. If one frequency fades or is interfered with, the other frequency should provide a good strong signal. Space diversity is the other type you may see. In space diversity, two receivers on the same frequency use antennas that are physically as far apart as possible. The chances of frequency fading at both locations at the same time is minute. *Onboard ship its almost impossible to get antenna's very far apart. This is mostly used ashore where you have antenna fields.*

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A keyer does just the opposite as a converter. A keyer is used in the transmit side of a RATT circuit. A keyer will take DC input from terminal equipment or crypto devices and generate AF tones. These tones are patched to a transmitter for transmission. The keyer may also provide the control signal to activate the transmitter.

2. Common Shipboard converter/keyers

The most common converter/keyer onboard ships today is the AN/URA-17F. The 17F is a converter/keyer since it is capable of both functions. The 17F is comprised of two identical converters, the CV-3510B as shown on diagram sheet 3-15-4. Two 3510B's allow the 17F to operate in single or diversity mode. The 17F has some improvements over earlier models. An LED display shows signal strength and earlier models could not act as a keyer. There are five modes of operation for the 17F which we will discuss during setup.

The CV-2460/SGC is also very common and has been a stable for many years. The 2460 uses a meter to show signal strength. It has the ability to function as both a converter and keyer. There are four modes of operation and standby, on the 2460 which will be discussed during setup.

3. Setup Procedures for AN/UGC-17F

A. AN/URA-17F before getting into the setup procedures you must know what controls and indicators there are and their purpose.

- 1) TRANSMIT – Five position switch showing frequency bands. Controls mark and space tone frequencies used for modulation while transmitting.
 

(1)	LF	915Hz mark/1085Hz space
(2)	VLF	1000 Hz mark/1050Hz space
(3)	HF	1575Hz mark/2425Hz space
(4)	UHF	500Hz mark/700Hz space
(5)	MMM	1615Hz mark/1785Hz space
  
- 2) RECEIVE – Five position switch showing frequency bands. Controls what audio tones are converted into marks and spaces.
  - (1) Same as the transmit switch
  
- 3) DATA RATE – Four-position switch. Reflects the baud rate used.
  - (1) 45.5
  - (2) 50
  - (3) 75
  - (4) 150

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- 4) RCV Level - Adjusts audio input level. LED display indicates level
- 5) Control – Five position switch showing the modes of operation.
  - (1) RCV – Converter operates in receive-only mode
  - (2) XMT – Converter operates in transmit-only mode
  - (3) AUTO – Converter Operates in transmit or receive mode with a return to stand-by between changes.
  - (4) FDX – Converter operates in FULL DUPLEX mode. Able to receive and transmit simultaneously and independently.
  - (5) DIV – Converter operates in Diversity mode (receive only).
- 6) XMT – toggle switch to select RVS (reverse) or normal keying.
- 7) RCV – Toggle (Same as XMT)
- 8) POWER – ON/OFF toggle with an indicator

B. The setup procedures for a half-duplex circuit are listed below. Half-duplex operation means you can transmit or receive, but not at the same time. This is the most common mode of operation

- 1) Verify equipment is energized. Set Control switch to AUTO. Set XMT and RCV switches to RVS
- 2) Set the RCV LEVEL control to 3
- 3) Set RECEIVE switch to frequency band being used
- 4) Set DATA RATE switch to desired Baud Rate.
- 5) Tune associated receiver /transceiver
- 6) Fine tune receiver and adjust RCV LVL control until LED bar columns has Five to eight bars on it in the mark and space columns.
- 7) Set the TRANSMIT switch to frequency band being used.
- 8) Tune transmitter/transceiver to desired frequency.
- 9) Transmit and receive a TTY message to verify operation.

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- C. Diversity operation – Remember this requires two CV-3510B’s.
  - 1) Same as single mode through step (5).
  - 2) Set CONTROL switch to DIV
  - 3) Repeat steps (1) – (6) for second converter of the group
  
- D. Power Off  
No special steps required. Simply turn power switch off.
  
- 4. CV-2460/SGC setup procedures
  - A. Controls and indicators with their purpose
    - 1) Power indicator
  
    - 2) Freq. Option - A=500Hz space and 700Hz mark  
B= 1575Hz space and 2425Hz mark  
*NOTE: Notice these are opposite of the URA-17F.*
  
    - 3) Keying switch - 4 position rotary switch to select normal or reverse keying.
  
    - 4) Mode switch - 5 position switch used to select mode of operation.
      - (1) Send – Simplex Send only
      - (2) Receive - Simplex Receive
      - (3) Standby - Half Duplex switching automatically
      - (4) FDX – Full Duplex
      - (5) S/R BTB – Send/Receive Back To Back
  
    - 5) Receive Loop Cur - Maintenance function only
  
    - 6) Meter Switch - 8 position switch to control meter usage
      - SEND - CUR (Current) Bias and LVL (level)
      - RCV - CUR (Current) Bias and LVL (level)
      - V and OFF
  
    - 7) Meter - shows indications controlled by the meter switch
  
    - 8) Receive indicator - lights when a receive signal is detected
  
    - 9) Send indicator - lights when send section is active
  
    - 10) Send Monitor jack - allows operator to monitor send audio with headphones.

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- 11) Send Loop Current - Maintenance function only
  - 12) FAILURE WHEN LIT - glows to indicate blown fuse element in 6 VDC circuit.
  - 13) Fuses with indicators
- B. Setup procedures for half duplex operation are as follows:
- 1) Set Power to ON
  - 2) Set FREQ OPTION
    - a) A – UHF
    - b) B – HF
  - 3) Keying
    - a) N/N for Normal keying
    - b) R/R for Reverse keying
  - 4) Mode
    - a) STDBY - automatically switches between transmit and receive function
  - 5) Verify transceiver settings and patching.
  - 6) Transmit and receive a teletype message to verify operation.
- C. Full duplex operation is not commonly used. It would require two converters, transceivers, or a receiver and transmitter. One converter would be in send mode and one in receive mode.

**DIAGRAM SHEET 3-15-4**

**AN/URA-17F/CV2460**



AN/URA-17F converter/keyer– Comprised of two CV-3510B/UG converters in an enclosure.



CV-2460/SGC converter/keyer



**JOB SHEET 3-15-5 Converter Set-up**

A. INTRODUCTION

In this exercise, the trainee will energize and set-up AN/URA-17F and CV-2460/SGC for half-duplex operation. The instructor will initial each step to show completion if desired.

B. EQUIPMENT

AN/URA-17F and CV-2460/SGC keyer/converters. T-23D transmitter group with AN/URA-38 coupler

C. REFERENCES

1. NAVSHIPS 0967-LP-340-0010 Technical Manual for Comparater-Converter Group AN/URA-17F
2. NAVELEX EE162-AB-MMO-010/E110 CV2460 Technical Manual for Telegraph-Telephone Signal Converter

D. PERFORMANCE STEPS

1. Energize the AN/URA-17F Keyer. Preset controls for half/duplex operation with an AN/WSC-3 transceiver.

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INST

2. Locate AN/URA-17F input and output on audio patch panels. Locate AN/URA-17F input and output on DC patch panels.

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INST

3. Energize the CV-2460/SGC Keyer. Preset controls for half/duplex operation with an AN/URT-23D transmitter group.

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INST

4. Locate CV-2460/SGC input and output on audio patch panels. Locate CV-2460/SGC input and output on DC patch panels.

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INST