

NAVPERS _____

TRAINEE'S GUIDE

FOR

U.S. NAVAL SUBMARINE SCHOOL, OPERATIONS ADVANCED TRAINING

AN/UGC-20/25 TELETYPE

MAINTENANCE COURSE

VOLUME 2

INFORMATION SHEETS

NOTE-TAKING SHEETS

SELF TEST ITEMS

TRAINS OF PARTS

MAY 1971

DEPARTMENT OF THE NAVY
Bureau of Naval Personnel
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FOREWARD

1. NAVPERS _____ Trainee's Guide for the AN/UGC-20/25 Teletype Maintenance Course, Class "C", is approved for use in the AN/UGC-20/25 Teletype Maintenance Course A-160-0064, and is effective upon receipt.

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TRAINEE'S GUIDE

FOR

AN/UGC-20/25 TELETYPE MAINTENANCE

NAME _____

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AN/UGC-20 TELETYPEWRITER

PREFACE

Safety

The use of this equipment involves voltages which are dangerous and may be fatal in contacted. Extreme caution should be exercised when working on this equipment. The attention of operation and maintenance personnel is directed to NAVSHIPS 0901-670-0002 Naval Ships Technical Manual Chapter 9670 or superceding instructions on the subject of electrical precautions to be observed.

The following rules must be strictly observed:

- Keep away from live circuits as much as maintenance permits.
- Never repair or adjust equipment alone.
- Always ascertain that the UGC-20 teletypewriter and any test equipment in use is properly grounded.

The AN/UGC-20 teletypewriter is a precision machine using small mechanical parts that are easily damaged. Extreme care should be exercised when making adjustments. Avoid excessive pressure when tightening screws, nuts, etc. to prevent stripping. Do not use small parts for pry points. Ensure machine is not binding before energizing motor circuit.

Purpose

The guide is not intended to duplicate information in the Technical Manual or other materials related to this equipment but used for the purpose of (1) providing you with the material required during the course that will promote optimum development of your technical knowledge and your technical competence with respect to the use of maintenance tools, trouble shooting teletypewriter equipment, and the performance of maintenance routines, and (2) providing you with sufficient reference material that will enable you, upon return to your unit, to read and use the Technical Manual effectively.

This guide is designed specifically around the AN/UGC-20 teletypewriter but has been developed to train personnel in maintenance of this and similar equipments in the Model 28 family of teletypewriters.

How to use the guide

The information contained within this guide is organized in the same sequence as the course of instruction and parallels the Sections and Topics presented by the instructor. This reduces to a minimum the need for elaborate note taking and provides more instructional time to cover and explain the subject matter of the course.

Self test items are provided throughout the guide. These are to be used as a yard stick to tell you how well you are progressing, whether you are getting the necessary information, and whether you are maintaining a proper level in the course. These test items will require study of the text (NAVSHIPS 0967-059-9010, (Bulletin 284B) and (Bulletin 295B), as well as this guide.

Job sheets are provided to assist you in performing maintenance routines and to provide for graded application. Adjustments as listed in the technical manual have been modified to provide accurate, logically organized procedures for you to follow.

This guide, if used in a conscientious manner, will be a valuable tool for you to use when you leave this school. We sincerely hope our efforts here will benefit you and your command.

IMPROVEMENT OF STUDY HABITS

INTRODUCTION

You have just begun a course of instruction in Teletype Maintenance. The subject matter is highly technical and you will be required to put in many hours of study in order that you may complete the course of instruction satisfactorily. Many of you have been away from classroom work for a long time so it is important that you be re-acquainted with proper study habits. There will be an instructor from the course available for mandatory night school, or to assist you after normal school hours. There are times however, when you may want to study on your own and this information is designed to help you in this endeavor.

INFORMATION

General

This course of instruction is one of the best the Navy has to offer. You are one of the fortunate few selected for this training, upon satisfactory completion you will receive a 2345 Job Code Number (provided all other eligibility requirements are met). Also, many industries and large corporations are currently developing or utilizing their own Teletype communications systems, creating a demand for highly skilled TTY maintenance personnel.

Another important point is to SEEK HELP WHEN YOU NEED IT. When you are studying and get confused, ask a buddy in your class to help. If this will not solve the problem, make arrangements to talk to your instructor, he will be glad to help you.

If you have a personal problem which is keeping you from giving your all to your studies, ask to see the chief instructor. Every effort will be made to help you, and your personal business will be kept in the strictest confidence.

Preparation for Study

The term "STUDY", as used in this information sheet, means a concentrated effort on the part of the student to develop further understanding of the subject matter and to fix this information firmly in his mind. Here is a list of things to check to make sure you are ready to study.

1. Make sure the place you are going to study is good for the purpose. If it is too noisy, cold, hot, stuffy, etc., you are obviously not going to be able to concentrate. Be sure to pick a good place.
2. Be sure your physical condition is good. Don't try to study if you are suffering.
3. Free your mind from worry about other problems. Erase everything from your mind except your desire to improve.
4. Make sure you have everything you will need for study, i.e. pencils, paper, books, etc.
5. Keep in mind that the most important factor for you to consider is your attitude towards the subject matter.

Method of Study

For most students, the first three weeks (Orientation Phase) of this course appear hard because of the large amount of material covered. Without a definite study method, time can be wasted with little learning accomplished. A good study method is required. One that is organized, logical and that won't waste time and effort. A good study method can be obtained by understanding how the classroom instruction is organized and can be used as a guide to devise a compatible study method.

Here is how the classroom instruction is organized:

First, the instructor will identify the mechanical parts, show you their shape and their physical placement in relation to each other. He will use transparencies/charts and actual equipment for this.

Second, with the aid of transparencies/charts, he will demonstrate and explain the movements of the mechanical parts and how they act upon each other

Third, he will demonstrate and explain the powers required to move the parts with the aid of transparencies/charts.

Fourth, with the aid of transparencies/charts, he will summarize by explaining the movements and powers in logical sequence to present the overall mechanical operation.

Now it becomes apparent that there are three main areas of subject matter you must learn. Stated briefly they are:

1. Parts
2. Movements (transfer of motion)
3. Powers

After one day of class, you will realize that a great deal of independent study will be necessary to understand and retain the subject matter presented. The most logical way to study the subject matter is in the same order it was presented in class. The following study method is based on this concept.

The Trainee Guide is your most important source of material because it parallels the classroom instruction. There are four recommended steps for studying the material in this trainee guide. They are as follows:

Step 1

Name and identify the parts.

The first time the name of a part appears in the text of an information sheet, it is capitalized and placed along the left hand margin. They are listed in proper operating sequence. Without reading the text of the information sheet, read the names of the parts that appear down the left hand margin and go to the pictorial and identify the part. Do this until you can associate the name to the shape and locate it on the pictorial with ease. Remember to identify and locate the parts in the order that they appear in the text of the information sheet. This will help you later on.

The purpose of this step is for you to be able to readily associate the name, shape and the location of each part using a pictorial or the equipment.

Step 2

Understand how the parts move.

Read the information sheet carefully. Read the operation of each part then look at the appropriate figure and visualize its movement. If necessary use your finger and trace the movements and also read out loud if you can. These physical actions will help make a stronger impression. Go through the complete operation in this manner as many times as necessary to understand the operation of all the parts.

The purpose of this step is for you to be able to explain what moves each part and the direction of movement using the figures in the workbook.

Step 3

Understand the Source of Power to Move Each Part.

Go to the figure and trace through the the operation in the same manner as step 2, but pay particular attention to the action of those parts that are a power as defined in the power law. (Power laws will be explained in classroom instruction.) Do not try to memorize verbatim what power moves each individual part. There are many more parts than powers. Instead study with the concept of being able to pick out any part in the figure at random and trace back through the train of parts until you come to the power and then identify it.

The purpose of this step is for you to be able to trace out and identify the power to move each part.

Step 4

Self-Evaluation

Go to the blank pictorial book and turn to the pictorial that corresponds to the lesson you have studied. Now trace through the operation, name the parts, state their movements and identify the powers and their action as you go along. Any weakness will become apparent, and you will know what must be restudied.

Use these four steps to study each lesson. Study each lesson in the same order they were presented during classroom instruction. This will tie in all subject matter in proper order and eliminate many confusing factors.

This is only a recommended method of study; however, it has proved to be very effective. Some students have their own methods that obtain the same satisfactory results. It is up to you to determine what is the best study method to use.

After the Orientation Phase will come the Adjustment and Trouble-Shooting Phases; at this time the actual AN/UGC-20 Teletypewriter and the Technical Manual will be used. Classroom time will be used in working on the equipment making adjustments first, followed by location troubles placed on the machine. To assist you in your studies in these phases, some principles of learning are listed below.

Learning

Learning does not come automatically from reading and listening, but is a science based on well-defined principles and procedures. There

are four well-defined rules and principles to consider that encourage learning.

1. Motivation - you must have a desire to learn.
2. Concentration - Focus your full attention and full power of your mind on the subject matter you are attempting to learn.
3. Organization - Fit the subject matter together. First get the general pattern of what you are going to learn, then get the details in more concentrated study.
4. Repetition - Repetition is essential, but learning must also include the other rules and principles.

Comprehension comes through practice of the principles discussed.

TOPIC OBJECTIVE

When you complete this topic, you will be able to:

LOCATE and IDENTIFY the major components on the AN/UGC-20 equipment, and STATE the function of each major component.

EXPLAIN the relationship of the AN/UGC-20 to the MOD 28 family of teletype equipments.

UTILIZE correct terminology in accordance with the technical manual and the trainee guide throughout the course.

EXPLAIN the purpose and theory of the five unit code, giving the time duration of the start, stop, and five intelligence impulses, and the electrical values.

EXPLAIN baud rate and its relationship to WPM speed, giving the method of determining each.

EXPLAIN the hook up of a simple teletype loop.

INTRODUCTION TO AN/UGC-20

INTRODUCTION

This information sheet presents a general introduction to the AN/UGC-20, speed of operation, gear set data, and power requirements.

REFERENCES

NavShips 0967-059-9010, Bulletin 284B, Technical Manual 28 compact Keyboard Send-Receive (KSR) and Receive only (RO) Teletypewriter sets.

Bulletin 295B Technical Manual Motor Units
NavShips 0967-059-9020 Bulletin 1197B (parts)

GENERAL

The AN/UGC-20 Teletypewriter is a rugged and versatile machine. It is an electromechanical apparatus capable of operating as a self-contained message originating and receiving center. It is used to exchange printed messages between two or more stations connected by appropriate transmission facilities (telegraph lines, telephone networks, and radio channels).

Messages are received electrically via the transmission facility and are printed on page-size copy paper or continuous business forms. With page-printed monitoring, the AN/UGC-20 Set can electrically transmit messages which are originated by key-board operation.

Transmissions between stations is accomplished electrically using the Baudot teletypewriter signaling code.

Since the various equipments of the Model 28 family such as the TT-47, TT-176, all use the same basic units as the AN/UGC-20, in greater or lesser quantity, a graduate of this course will be able to maintain any of these equipments.

The AN/UGC-20 as well as the rest of the Model 28 family of teletypewriters, is manufactured by the Teletype Corporation. It should be noted that "Teletype" is a trade name. This word is a connotation of teletypewriter (type at a distance) and is used extensively throughout this course. There are, however, other manufacturers of teletypewriters and equipment and this equipment should be referred to as teletypewriters or by their trade name or model designators.

INFORMATION

Speed

The AN/UGC-20 operates at speeds up to 100 words per minute. In this school the AN/UGC-20 is used at 60 words per minute operation.

The operating speed is changed by changing gear sets (or ratios) in the keyboard base to any of 3 speeds.

The gear set data required to change operating speed can be located in the Technical Manual on the following pages:

Keyboard base, ISS 1, SECTION 573-116-102TC, page 14

Occasionally a machine is used on circuits employing the 7.0 transmission pattern vice 7.42. To change speed of such equipment requires a more extensive gear change and in addition it is recommended that the selector cam sleeve assemblies be changed. This subject will be covered more thoroughly in later lessons.

Power Requirements

The AN/UGC-20 as well as other of the Model 28 family of teletypewriters operates from 115 VAC 60 cycle single phase. The current requirements will vary with the different models.

COMPONENT PARTS OF THE AN/UGC-20

INTRODUCTION

The AN/UGC-20 is composed of the following major components: the keyboard, the Automatic Typer, the Motor, the 3 speed gear shift assembly and Distributor Clutch assembly, and the Cabinet. This information sheet will give you a brief description of these components.

REFERENCES

Navships 0967-059-9010, Bulletin 284B Technical Manual 28 Compact. Keyboard Send-Receive (KSR) and Receive only (RO) Teletypewriter sets

Navships 0967-059-9020, Parts Manual

INFORMATION

Keyboard

The Model 28 Compact Keyboard Send-Receive (KSR) AN/UGC-20 and Receive Only (RO) AN/UGC-25 are equipments designed to provide normal teletypewriter service in mobile and fixed stations where minimum equipment size is prime requisite. The equipment size has been minimized by utilizing a modified Model 32 Keyboard and a slightly modified Model 28 typing unit. All mechanisms have been mounted to occupy minimum space.

The Major components and functions are found in the Technical Manual (Bulletin 284B) section 573-116-102, pages 1 through 6.

Automatic Typer

The automatic typer sits on the keyboard base and is secured by pilot screws. It consists of the selector unit and associated trains of parts necessary for selecting and printing a character, and the main shaft with individual clutches of the machine, the function box, type box and the front plate assembly.

FIVE LEVEL TELETYPE CODE AND BAUD

INTRODUCTION

The teletypewriter was developed to emit and/or receive, and respond to, an electrical code in order to be able to send messages between distant stations more rapidly. Basically, the teletypewriter is a motor driven device designed for exchanging messages between two or more stations. The electrical code system used is called the five level teletype code. Each station must have a transmitting unit (keyboard or transmitter distributor) and/or a receiving unit (printer). The five level teletype code, BAUD, and a typical teletype circuit (loop) will be illustrated and explained in this information sheet.

REFERENCES

Navships 0967-059-9010, section 573-115-100, pages 8-9

INFORMATION

In ordinary telegraph transmission, intelligence was relayed from one point to another by the making and breaking of the signal line. An operator at one end would open or close a telegraph key and cause a sounder at the receiving end to emit pulses of sound which could then be translated into characters by the other operator trained to recognize the various code combinations. During the latter part of the nineteenth century, telegraphy took a step forward by substituting a mechanical sending mechanism for the old telegraph key and a printer for the trained operator.

The new method of printing telegraphy, however, required the modification of the old signaling method. The primary change has been in time control of the transmitted impulses. Specified time intervals or impulse lengths have replaced the somewhat arbitrary dot-dash system.

As devised by Emile BAUDOT, a french Signal Officer, the newer code required that each character have a certain combination of current and no current impulses to indicate the particular code combination. These current and no current impulses function much like ordinary telegraph transmissions. i.e. making (current) and breaking (no current) of the signal line. In teletype, a current impulse is a MARK impulse and a no current impulse is a SPACE impulse.



Transmitting Unit - transforms mechanical action of striking the keys into electrical impulses of the teletype code.

Signal Line - carries the teletype code (signal) in current and no current form from one station to another.

Receiving Unit - transforms electrical impulses back into mechanical motion that causes printing.

It was decided that each character should have five of these time intervals (or impulses). It may be seen that with two possibilities (MARK or SPACE) for five impulses: 5

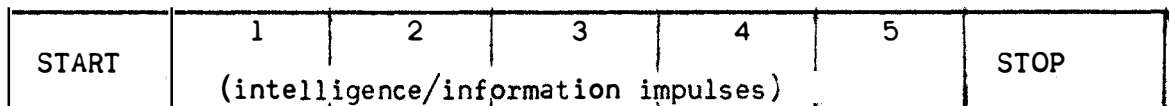
$$2^5 = 32 \text{ possible code combinations.}$$

Therefore, with the addition of an upper case (figures), the teletypewriter is capable of performing twice as many operation (printing and functions) as the number of available code combinations. In the lower case (letters), we have the 26 letters of the alphabet - plus 6 so-called functions. These functions are mechanical operations as opposed to the actual printing of a character.

To maintain synchronism between the sender and the receiver, it is necessary to establish a starting point and a stopping point. Consequently, a START (Spacing) impulse and a STOP (Marking) impulse was added to the five intelligence impulses. The START and STOP impulses are not considered intelligence impulses. The START impulse insures all machines start at the same time and the STOP impulse ensures all receiving machines have time to complete detection of the last intelligence impulse before the transmitter begins a new character. Therefore, you have a START impulse, five intelligence impulses and a STOP impulse, giving you a total of seven impulses for each character.

The START impulse is the same time interval (pulse length) as each of the five intelligence impulses. The STOP impulse is .42 times longer than the START impulse or an intelligence impulse. If we designated the START impulse (standard pulse length) as 1 unit, we have

ONE CHARACTER



SPACE (MARKING / SPACING) MARK

START impulse = 1 unit
 5 intelligence impulses = 5 units
 STOP impulse = 1.42 units
 7.42 units

7.42 units is known as the UNIT CODE

The length of time duration of the individual impulses is determined by the operation period of the various cams and levers that cause the signal line contacts to open and close (make and break). It may be seen then, that as the operation speed increases, the pulse length decreases.

Teletype utilizes three basic shaft speeds for 7.42 Unit Code; 368 OPM (Operations-per-minute, or Revolutions-per-minute), 460 OPM and 600 OPM. Based on a shaft speed of 368 OPM and one word consisting of 6 characters, the WPM (words-per-minute) and time required to send and/or receive one character can be figured as follows:

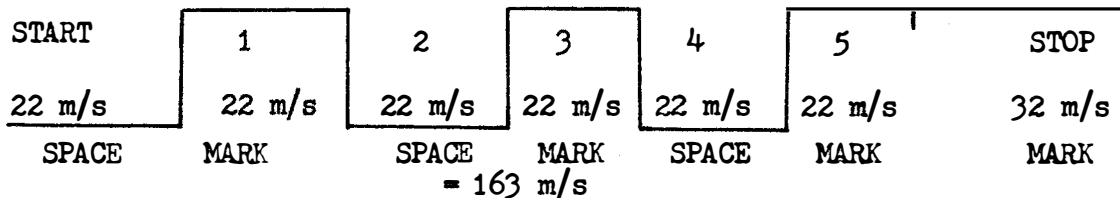
Shaft speed - $\frac{368}{6}$ OPM = 60 WPM
 One word -

Seconds-per-minute - $\frac{60}{368}$ = .163 Seconds-per-Operation
 OPM or 163 m/s (milli-seconds)

For maintenance or other technical purposes, it is far more accurate to deal only with actual shaft speeds.

Considering one character, the 163 m/s would be broken down as follows:

(Using "Y" as an example)



It will therefore require 163 m/s to send one character, regardless of how fast the operator is typing. If he sends only one character per minute, that character will be sent out and received by the other stations in 163 m/s. That part of the minute that the machines are not working, is an extension of the marking condition (a continuation of the STOP impulse beyond its 31 m/s). If the operator is typing 60 WPM, each character still takes 163 m/s but there is no time lost between each operation. Immediately after the 31 m/s STOP impulse, a START impulse is sent for the next character.

Western Union and other commercial companies operate with a STOP impulse the same length as an intelligence impulse and START impulse. With all seven impulses the same time duration, the UNIT CODE would be 7.00. The Navy also, is switching to the 7.00 UNIT CODE.

Baud

Baud (from BAUDOT) is an expression which combines shaft speed and unit code into one usable term or figure. It is derived by multiplying the Operations per second by the unit code, i.e.:

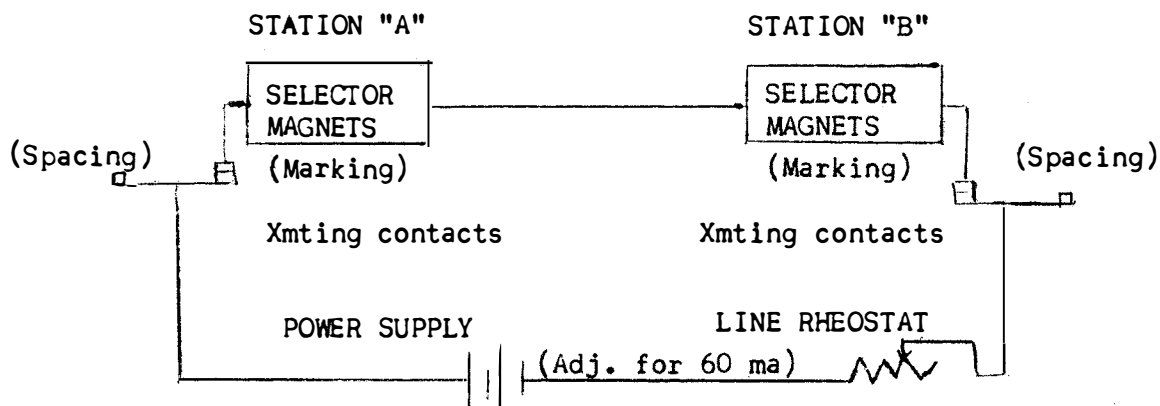
60 WPM machines:

$$\frac{368}{60} = 6.1 \text{ OPS} \times 7.42 \text{ Unit Code} = 45.5 \text{ Baud}$$

$$\frac{387}{60} = 6.45 \text{ OPS} \times 7.00 \text{ Unit Code} = 45.2 \text{ Baud}$$

A 7.42 unit transmitter can work correctly into a 7.00 unit receiver if the baud rate is the same for each machine.

The following diagram illustrates the method of connecting two stations. Notice that all parts are connected in series.



A discussion of the various units used for the generation and reception of the five level code follows:

Power Supply

The power supply furnishes 115 volts DC to the Signal Line circuit. The resistance in the line is adjusted for a current flow of 60 milliamps (ma) whenever the circuit is in a closed condition (a mark on the line).

Transmitting Contacts

The transmitting contacts make up the electrical part of the transmitter unit (Keyboard or Transmitter-Distributor). There is only one pair of contacts (marking) used in the transmitting unit. These contacts will open and close according to the character or function selected.

Selector Magnets

The Selector Magnets (electro-magnets) are the brains of the receiving unit. When current flows through them, they are a strong magnet—when no current is flowing through them, they immediately lose their magnetism. The Selector Magnets, through the medium of the Selector Armature, changes electrical energy to mechanical motion.

Signal Line

The Signal Line consists of the cable connecting the two stations. The station may also be connected by a radio teletype channel.

In the above diagram, Station B selector magnets, being in series with Station A selector magnets, will react to the signal in the same manner and at the same time as Station A. When Station A is sending, the transmitting unit of Station B will not be operating since only one station can send at a time in this type of circuit (half-duplex). Other types of complex circuits (systems) are also in use.

TERMINOLOGY AND POWER LAW FOR THE AN/UGC-20

INTRODUCTION

This information sheet has been developed to acquaint you with the basic terminology used in this course, and to explain what is meant by the power law. The understanding of this information will simplify communications between you and the instructor. The phrases in this sheet have been standardized for this course.

REFERENCES

Navships 0967-059-9010, Technical Manual 28 Compact Keyboard Send-Receive (KSR) and Receive Only (RO) Teletypewriter Sets

INFORMATION

This machine is a mechanical device employing a multitude of devices such as springs, cams, gears, levers, bails, etc., to accomplish work. Examples of machines are automobile engines, typewriters, adding machines, and of course teletype machines.

Listed below are the various names of mechanical parts that are used in teletype machines and a brief explanation of them. It would be quite impossible to cover or list and describe each and every part and its function or how it was named. Each part is usually prefixed by a name which denotes its operation or what it moves or what moves it, as the examples will show.

DEFINITIONS

BAIL

A bail is a device, usually a lever, that moves or is moved by more than one other part or device.

Example: 1. Carriage return bail. This bail is associated with the carriage return and allows or controls carriage return.
2. Function bar reset bail. The bail and the bail blade which moves all the function bars.

LEVER

A lever is a device in mechanics for leverage or mechanical advantage and/or transmitting or modifying force and motion.

Examples: 1. Keylever. A lever operated by a key on a teletype machine.
2. Code bar shift lever. A lever associated with the code bars

BELL CRANK

A bell crank is a lever which is not straight but forms an angle and is used to change the direction of movement. For example, if a lever moving the bell crank is moving up and down, this causes the bell crank to move another lever left and right.

Example: Code bar bell crank. A bell crank associated with the mechanism.

CAM

A cam is a precision piece of metal or fiber cut out in irregular shape as opposed to being perfectly round, usually mounted on a shaft, and used to impart a desired peculiar movement to a roller, pin, lever, etc. A cam will have one or more high and low sides as measured from the center. Cams are extensively used to provide complicated and exactly timed movements.

Example: Selector cam. The cam that is associated with and moves the selector levers.

DETENT

A detent is a mechanical device used to hold a moved part or train of parts in a given position until acted upon or moved.

ECCENTRIC

An eccentric is a precision piece of metal or fiber cut perfectly round but its pivot point is cut off-center. Usually it is mounted from its off-center pivot point. It is normally used with a follower which completely encircles the extreme outer edge of the eccentric. The primary use of the eccentric is to change rotary motion to a back and forth motion.

GEAR

A gear is a wheel with projections on it called teeth. A gear can be thought of as a device consisting of many levers providing continuing action. Gears come in many sizes and types, the names denoting how the teeth are cut.

Example:

1. Spur gear. The spur gear has the teeth grooved in a horizontal direction across the gear surface.
2. Helical gear. The helical gear has the teeth grooved in a diagonal direction across the gear surface.

RATCHET

A ratchet is a circular wheel having teeth. A ratchet differs from a gear in the manner or cut of the teeth and in how it is operated. A ratchet is usually pushed or pulled by a pawl operating back and forth.

PAWL

A pawl is a pivoted tongue or sliding bolt shaped to engage teeth on a ratchet.

SPRING

A spring is a mechanical device usually made of steel that has the ability to store up energy when compressed or stretched. This stored up energy can be used to accomplish work when the spring is suddenly released.

SHOULDER SCREW

A shoulder screw is a screw that usually has a built-up portion near the head.

PILOT SCREW

A pilot screw is a screw having an extended portion which is not threaded.

FLAT WASHER

A flat washer is a circular object with a hole in its center, usually made out of metal or fiber and used with a screw, bolt, or nut on a mechanical part that is adjustable or movable within an elongated hole.

LOCK WASHER

A lock washer is a mechanical device, engineered to lock a screw, bolt, or nut in place, when compressed.

TRAIN OF PARTS

A train of parts is a series of mechanical parts used to accomplish an ultimate end.

Example: The parts involved in the tripping of the Distributor Clutch assembly are considered a train of parts.

SPECIAL PHRASES AND TERMINOLOGY USED IN THE COURSE

Phrases indicating a DIRECTION of MOVEMENT or TYPE of MOVEMENT:

Up and down
Right and left (abbreviated Rt & Lt)
Front and rear
Clockwise (abbreviated CW)
Counterclockwise (abbreviated CCW)

Phrases indicating the DIRECTION of VIEWING:

As viewed from the front
As viewed from the right
As viewed from the left
As viewed from the top
As viewed from the bottom
As viewed from the rear

NOTE: When not specified, the view is always considered as being FROM THE FRONT OR RIGHT.

Phrases indicating the Condition of the Machine:

Running Normal: The machine is operating correctly in all respects.
Running Open: No signal line current to the selector magnets.
Running Closed: Selector magnets always energized, machine cannot be keyed.
Garbling: Machine not printing the correct character and/or functions are inoperative.

Defining the power law and what moves a part:

Power is the force for moving a part or train of parts. Power is expressed as the name of the part which initiates the movement (force). For simplicity, since many types of parts furnish power in the UGC-20 each major component is give its own power law.

For example, the power law for the keyboard is:

Springs, THROUGHOUT the Keyboard Transmitter.

According to the above power law, power must originate from a keyboard spring within the keyboard; therefore, other parts in the keyboard cannot be a power because they are not listed in the power law.

The power law for each major component will be contained in the first information sheet concerned with that particular component.

What Moves: Here we are concerned with the part that actually touches and/or engages a part and moves it.

TOPIC OBJECTIVE

When you complete this topic, you will be able to:

STATE the purpose, NAME each part involved, and EXPLAIN the overall operation of the clutch.

Operation of regenerative type clutch.

OPERATION OF THE REGENERATIVE TYPE CLUTCH

INTRODUCTION:

The objective of this information sheet is to teach engaging and disengaging of a typical regenerative type clutch using correct terminology. The information covered in this lesson applies to the basic operation of all clutches used in the AN/UGC-20 Teletypewriter.

REFERENCE:

NAVSHIPS 0967-059-9010, Section 573-115-100, page 10.

INFORMATION:

Engaging

When the
CLUTCH STOP LEVER is tripped, the
CLUTCH SHOE LEVER SPRING moves the
CLUTCH SHOE LEVER away from the
STOP LUG on the
CLUTCH CAM DISK. The upper ear on the
CLUTCH SHOE LEVER forces the upper portion of the
PRIMARY SHOE into engagement with the serrated (sawlike teeth along the
edges) surface inside the

CLUTCH DRUM, which drives the PRIMARY SHOE down and CCW. The PRIMARY SHOE then strikes the

SECONDARY SHOE forcing it into engagement with the CLUTCH DRUM. The CLUTCH DRUM will move the SECONDARY SHOE up and CCW until it comes into contact with the

LUG on the CLUTCH CAM DISK. Now the CLUTCH CAM DISK will start rotating.

Disengaging

When the

CLUTCH STOP LEVER is moved into the path of the

CLUTCH SHOE LEVER, the lower end of the CLUTCH SHOE LEVER is moved toward the

STOP LUG on the

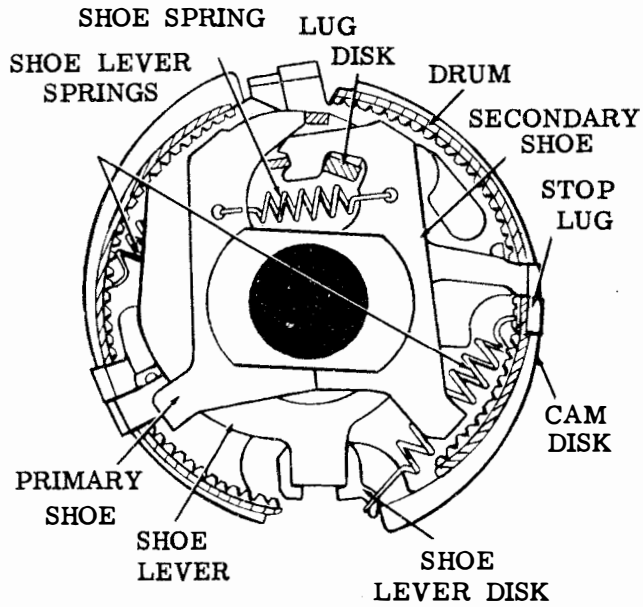
CLUTCH CAM DISK. The upper end of the CLUTCH SHOE LEVER pivots around its lower ear and allows its other (upper) ear to move toward the right.

When the

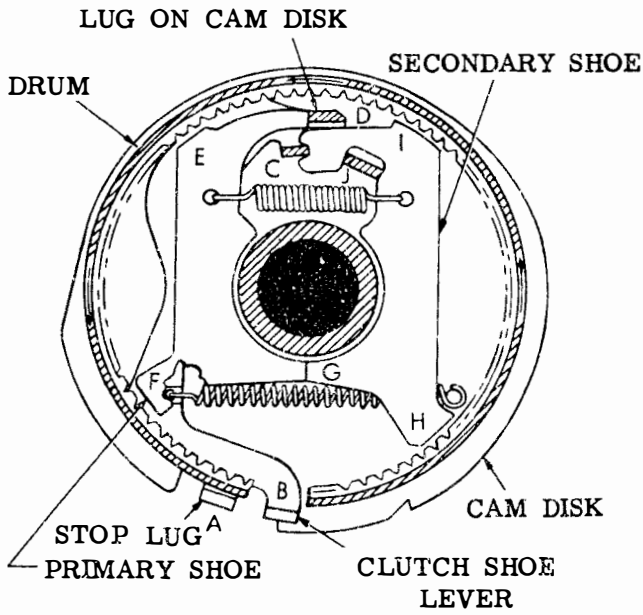
PRIMARY and SECONDARY SHOE LEVER SPRING pulls the

PRIMARY and SECONDARY SHOES together and CW, and away from the serrated surface on the inside of the

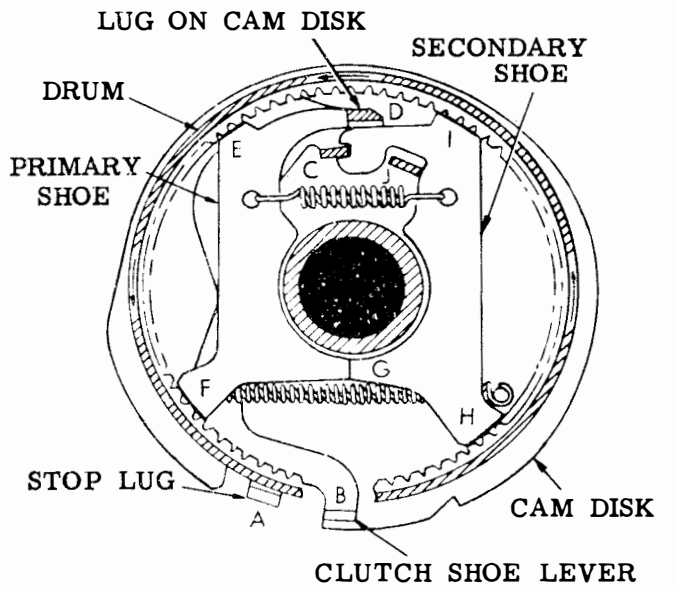
CLUTCH DRUM. Now the CLUTCH is disengaged.



Three Stop Clutch



One Stop Clutch (Disengaged)



- One Stop Clutch (Engaged)

TOPIC: KEYBOARD TRANSMITTER

TOPIC OBJECTIVES:

When you complete this topic, you will be able to:

State the power law for the Keyboard Transmitter, as given in the Trainee Guide.

State the purpose of operating/resetting the Codebar Submechanisms, name each part and explain the overall operation, including power.

State the purpose of the Universal and Non-repeat Mechanisms, name each part and explain the overall operation, including powers.

State the purpose of the Contact Mechanism, name each part and explain the overall operation, including powers.

State the purpose of the Reset Mechanism, name each part and explain the overall operation, including powers.

State the purpose of the Repeat Mechanism, name each part and explain the overall operation, including powers.

State the purpose of the Local Functions, name each part and explain the overall operation, including powers.

OPERATION OF THE CODEBAR SUBMECHANISMS

INTRODUCTION:

This information sheet describes the operation of the Codebar Submechanisms.

REFERENCE:

Bulletin 284B (NAVSHIPS 0967-059-9010) Technical Manual
Model 28 Compact Teletypewriter Sets, KSR and RO.

INFORMATION:

Purpose of Codebar Submechanisms is to preselect a character or function by positioning the five code level contact wires for a mark or a space.

The Power Law for the Keyboard Transmitter; Springs throughout the Keyboard Transmitter.

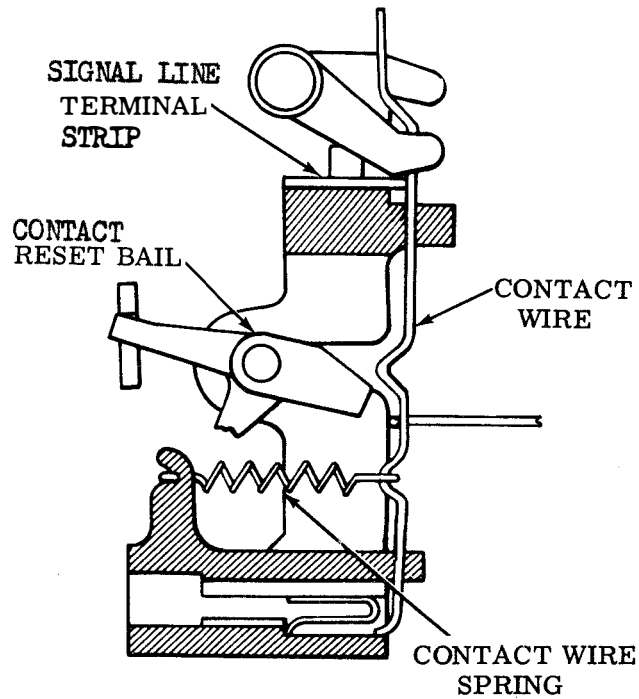
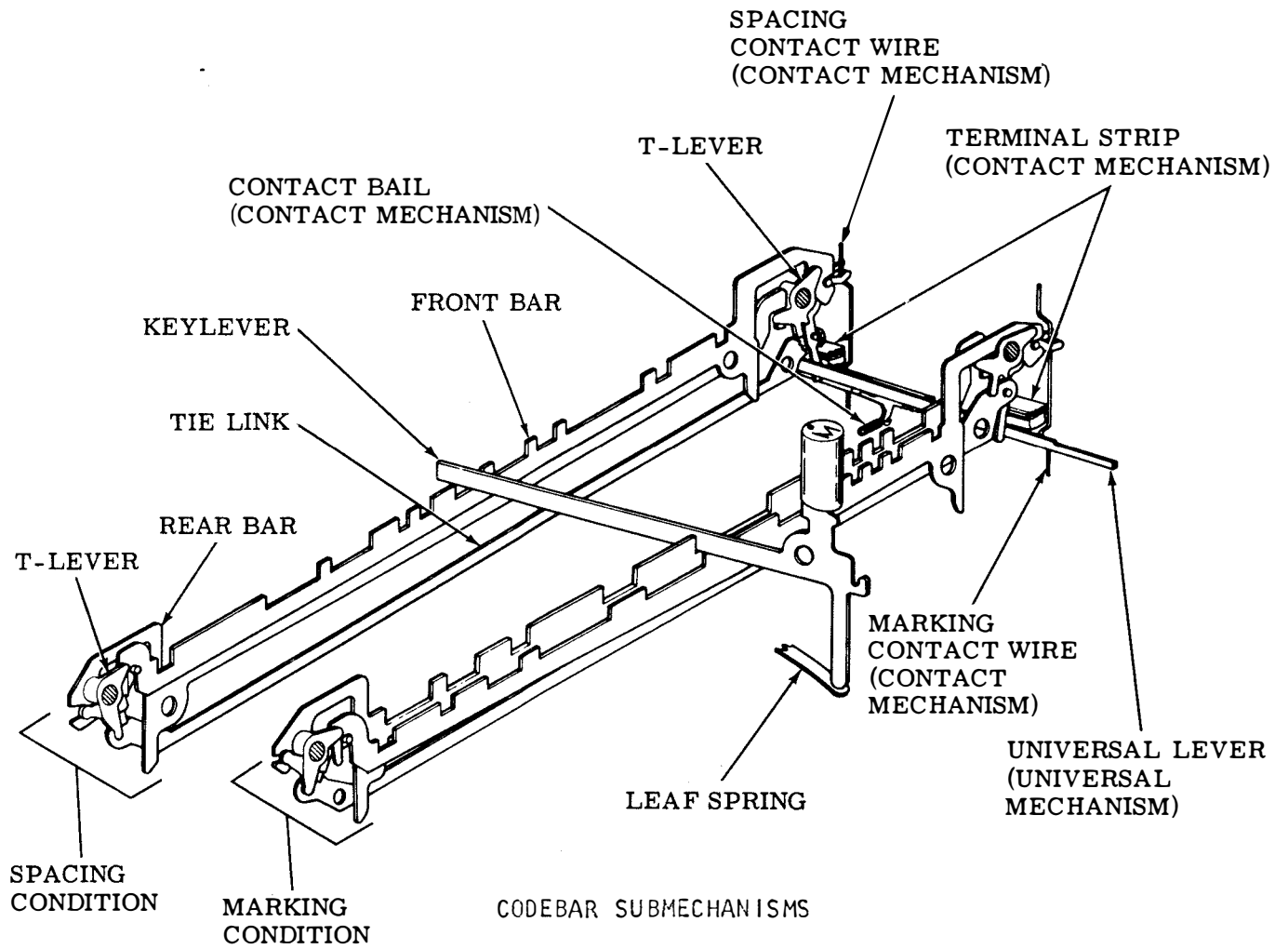
There are five codebar submechanisms consisting of a front bar, rear bar, tie link and two T-levers for each code level (intelligence pulse). They number one through five, rear to front.

When a
KEY or the
SPACE BAR is depressed, it moves the
KEYLEVER down against the tension of the
LEAF SPRING. When the KEYLEVER moves down it will enter a slot in the
REAR BAR, simultaneously make contact with the
FRONT BAR and take it down.

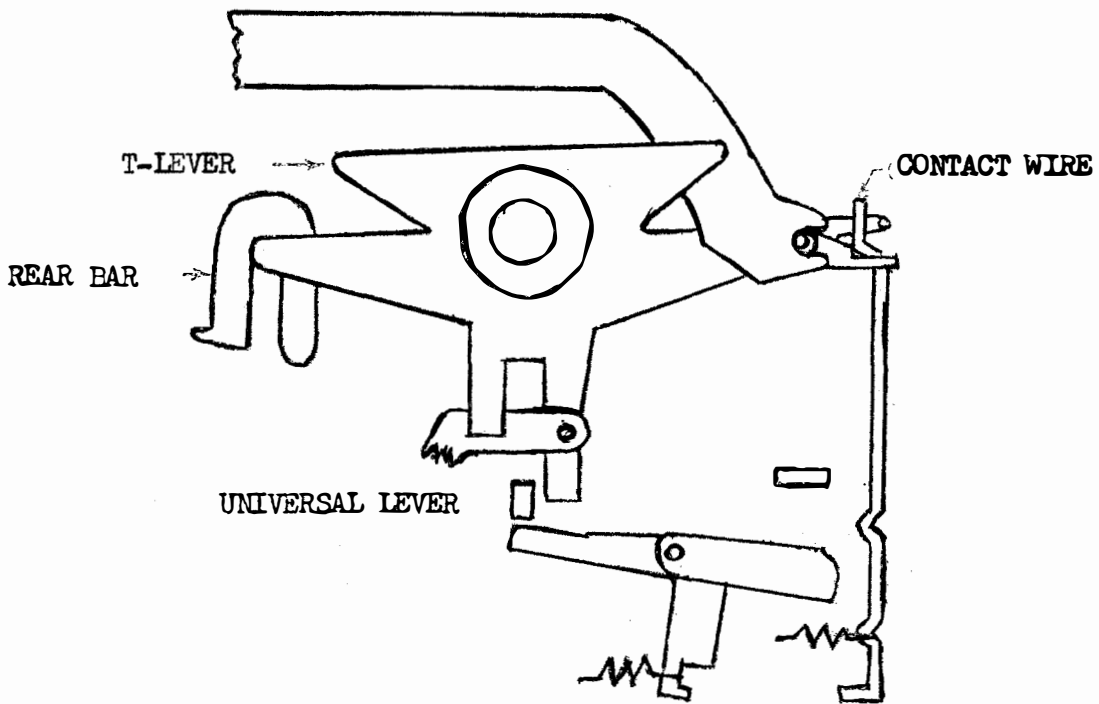
When the FRONT BAR moves down it will rotate the
LEFT and RIGHT T-LEVERS clockwise. The RIGHT T-LEVER will rotate away from the
CONTACT WIRE. The CONTACT WIRE is then free to move to the left and into
contact with the
SIGNAL LINE TERMINAL STRIP when the
CONTACT RESET BAIL is rotated away. The Codebar Submechanisms and the
Contact Mechanism are preset for a mark.

A space is attained when the REAR BAR moves down rotating the LEFT
and RIGHT T-LEVERS counterclockwise. In this position the RIGHT
T-LEVER will hold the CONTACT WIRE away from the SIGNAL LINE
TERMINAL STRIP.

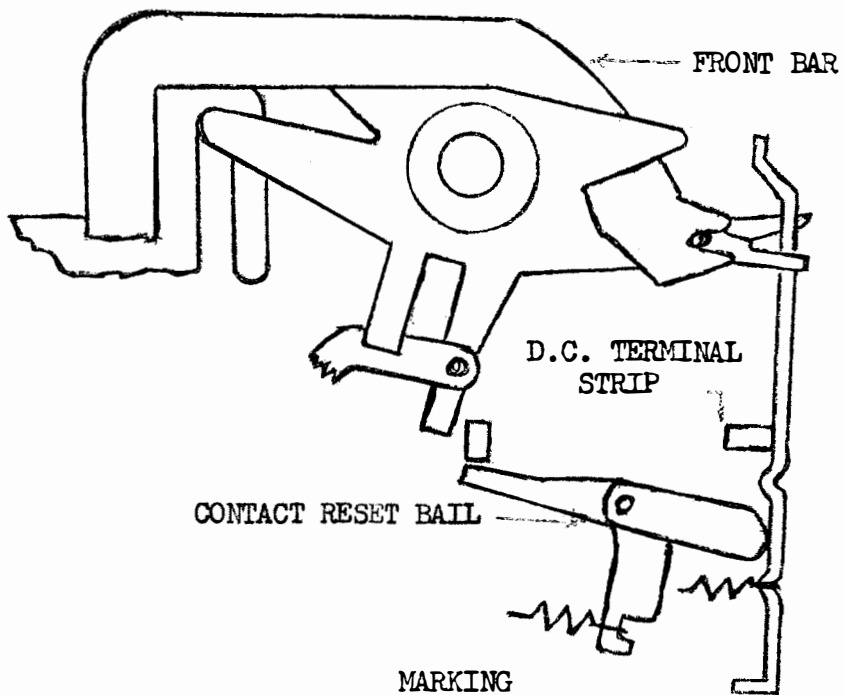
The
TIE LINK serves to hold the T-LEVERS in the proper relationship to each
other and facilitates the up and down movement of the FRONT and
REAR BARS.



CONTACT MECHANISM



SPACING



MARKING

OPERATION OF THE UNIVERSAL MECHANISM

INTRODUCTION:

This information sheet describes the sequence of operation of the Universal Mechanism.

REFERENCE:

Bulletin 284B (NAVSHIPS 0967-059-9010) Technical Manual, Model 28 Compact Teletypewriter Sets - KSR and RO.

INFORMATION:

The Universal Mechanism locks the T-levers in their selected positions and holds the Contact Reset Bail in its unoperated, normal stop position.

When a

KEY or the

SPACE BAR is depressed, it will move the

KEYLEVER down. Near the bottom of its travel it will come into contact with the

UNIVERSAL CODE BAR and move it down. When the UNIVERSAL CODE BAR moves down it will cause the right

UNIVERSAL T-LEVER to rotate clockwise. When the right UNIVERSAL T-LEVER is rotated clockwise the

TIE LINK will move to the left. The

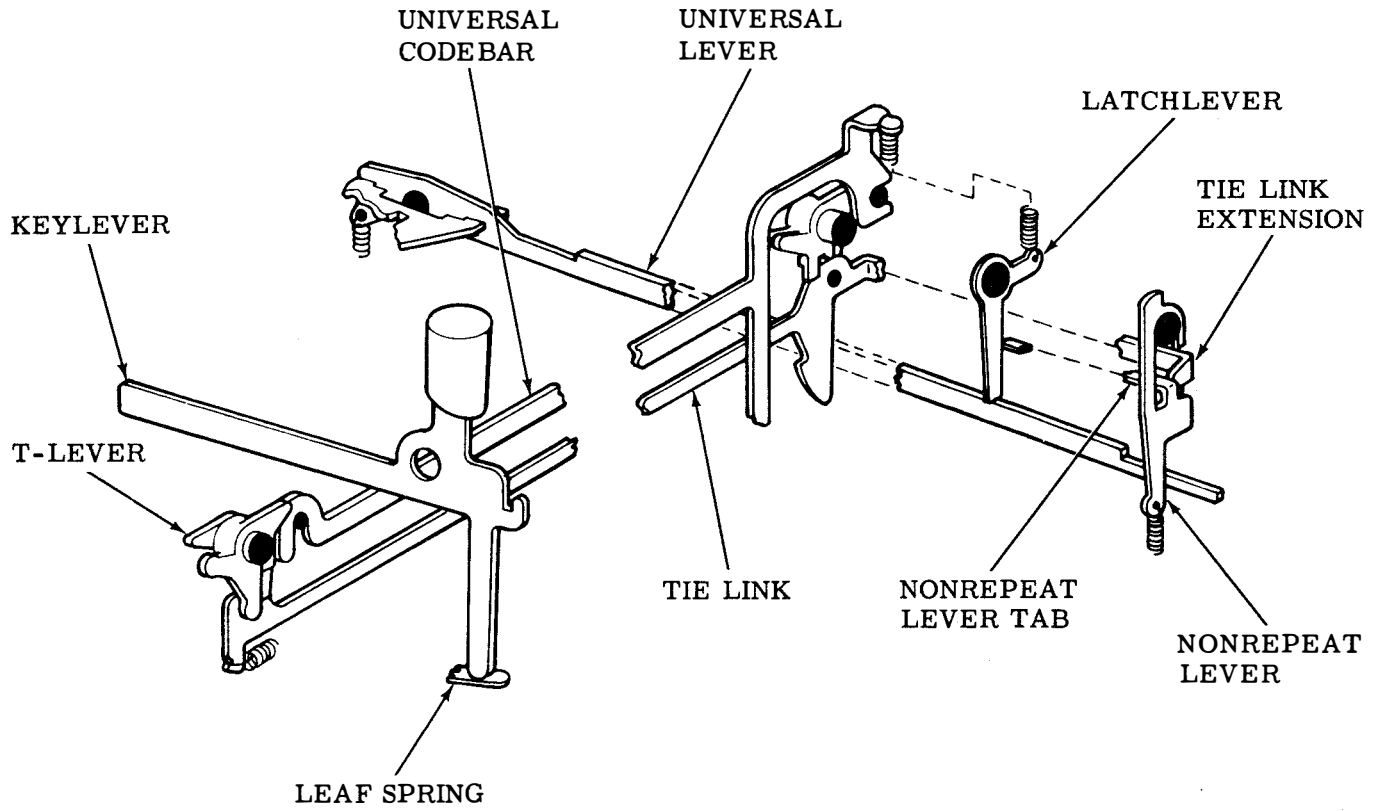
TIE LINK EXTENSION will come into contact with the

NON-REPEAT LEVER and rotate it clockwise. The

NON-REPEAT LEVER TAB, in moving to the left, will rotate the LATCH LEVER clockwise out of the path of the UNIVERSAL LEVER. With the

LATCH LEVER moved out of the way, the UNIVERSAL LEVER will rotate counterclockwise (lt), or the front end will move up, to lift the NON-REPEAT LEVER. When the NON-REPEAT LEVER moves up it will take the NON-REPEAT LEVER TAB up and move away from the TIE LINK EXTENSION allowing the NON-REPEAT LEVER to rotate counterclockwise. This allows the LATCH LEVER to rotate counterclockwise against the UNIVERSAL LEVER.

In the operated condition, the UNIVERSAL LEVER will hold the T-LEVER EXTENSIONS either left or right thus preventing another key from being depressed until the UNIVERSAL LEVER is reset.



Universal Mechanism

CONTACT MECHANISM

INTRODUCTION

This information sheet describes the sequence of operations of the Contact Mechanism.

REFERENCE

Bulletin 284B (NAVSHIPS 0967-059-9010), Technical Manual, Model 28 Compact Teletypewriter sets, KSR and RO.

INFORMATION

The Contact Mechanism responds to the Codebar Submechanisms and the Universal Mechanism. The Contact Wires complete the circuit by making contact with the SIGNAL LINE TERMINAL STRIP. The CLUTCH TRIP CONTACT WIRE is allowed to make contact with the AC TERMINAL STRIP to supply an impulse to the CLUTCH TRIP MAGNET on the DISTRIBUTOR.

The UNIVERSAL LEVER moves up, and allows the

CONTACT BAIL to move clockwise, under power of its spring, releasing the

CODE LEVEL CONTACT WIRES. The tops of the MARKING CODE LEVEL CONTACT WIRES are allowed to move to the left into contact with the

SIGNAL LINE TERMINAL STRIP and will remain there until the character has been transmitted.

The CLUTCH TRIP CONTACT WIRE makes contact with the

AC TERMINAL STRIP, and a current path to the

DISTRIBUTOR CLUTCH MAGNET is established. The DISTRIBUTOR CLUTCH MAGNET will attract the clutch trip armature, allowing the

DISTRIBUTOR CLUTCH to be engaged. The timing contacts on the DISTRIBUTOR open the CLUTCH TRIP CIRCUIT, deenergizing the CLUTCH TRIP MAGNET, causing the DISTRIBUTOR CLUTCH to disengage.

LINE BREAK OPERATION

INTRODUCTION:

This information sheet describes the sequence of operation of the Line Break Mechanism.

REFERENCE:

Bulletin 284B (NAVSHIPS 0967-059-9010), Technical Manual, Model 28 Compact Teletypewriter Sets, KSR and RO.

INFORMATION:

The LINE BREAK MECHANISM allows the operator to interrupt the circuit for signalling purposes by moving the LINE BRAK CONTACT WIRE away from the SIGNAL LINE TERMINAL STRIP to open the circuit.

The LINE BREAK MECHANISM consists of:

- LINE BREAK KEY
- LINE BREAK KEYLEVER
- LINE BREAK KEYLEVER RETURN SPRING
- LINE BREAK T-LEVER
- LINE BREAK CONTACT WIRE

When the

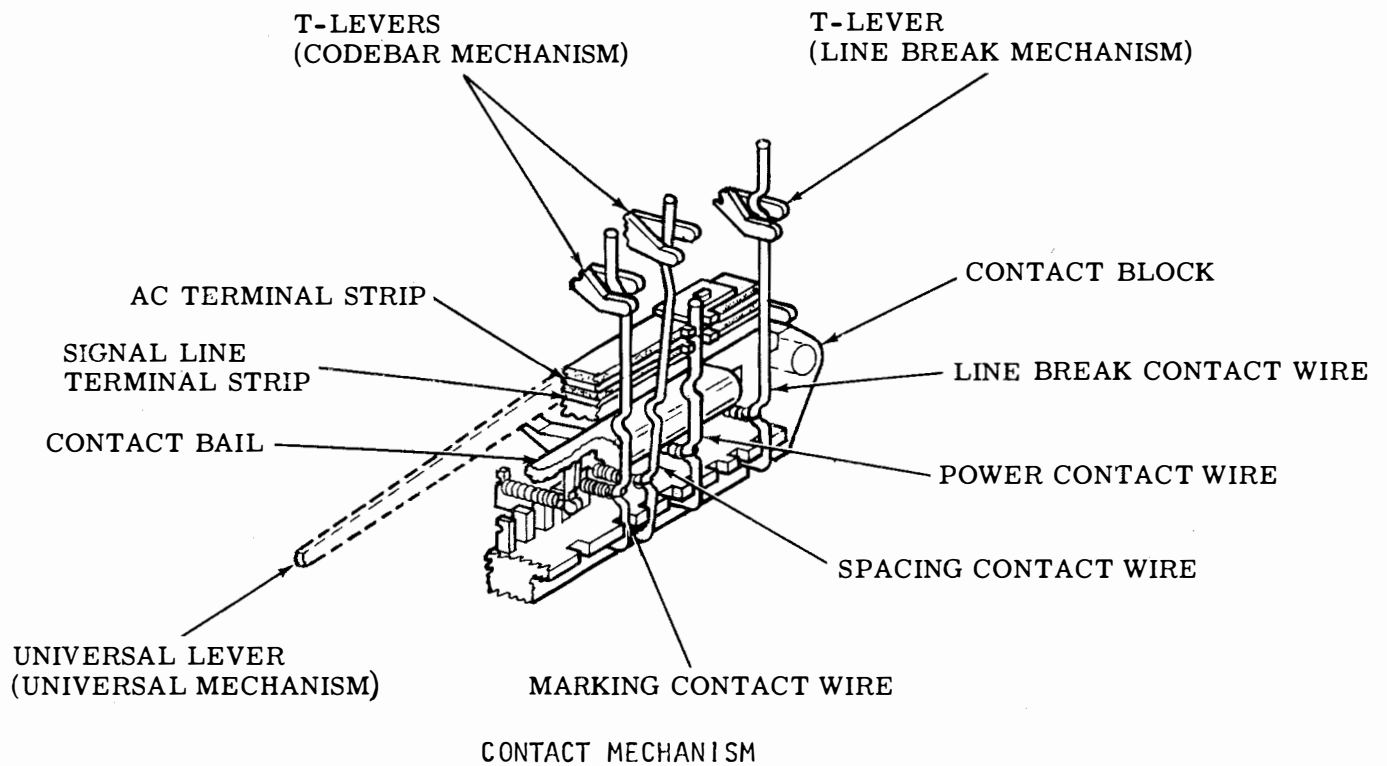
LINE BREAK KEY is depressed, the

LINE BREAK KEYLEVER will move down and rotate the

LINE BREAK T-LEVER counterclockwise, which will move the

LINE BREAK CONTACT WIRE top to the right, away from the SIGNAL LINE TERMINAL STRIP, opening the circuit until the key is released. The CONTACT WIRE is in series with the signal line.

The AN/UGC-25 uses a miniature switch to replace the LINE BREAK T-LEVER and the LINE BREAK CONTACT WIRE.



OPERATION OF THE RESET MECHANISM

INTRODUCTION

This information sheet describes the sequence of operation of the RESET MECHANISM.

REFERENCE

Bullitin 284B (NAVSHIPS 0967-059-9010), Technical Manual, Model 28 Compact Teletypewriter Sets - KSR and RO.

INFORMATION

The Reset Mechanism resets the Universal and Contact Mechanisms, to their normal stop positions, in preparation for the next character.

Near the end of the fifth intelligence impulse, when the

RESET SOLENOID becomes energized, it will move the

SOLENOID PLUNGER to the right, rotate the

RESET SHAFT LEVER and the

RESET SHAFT clockwise, causing the

RESET ARM to rotate clockwise.

The RESET ARM will move the front end of the

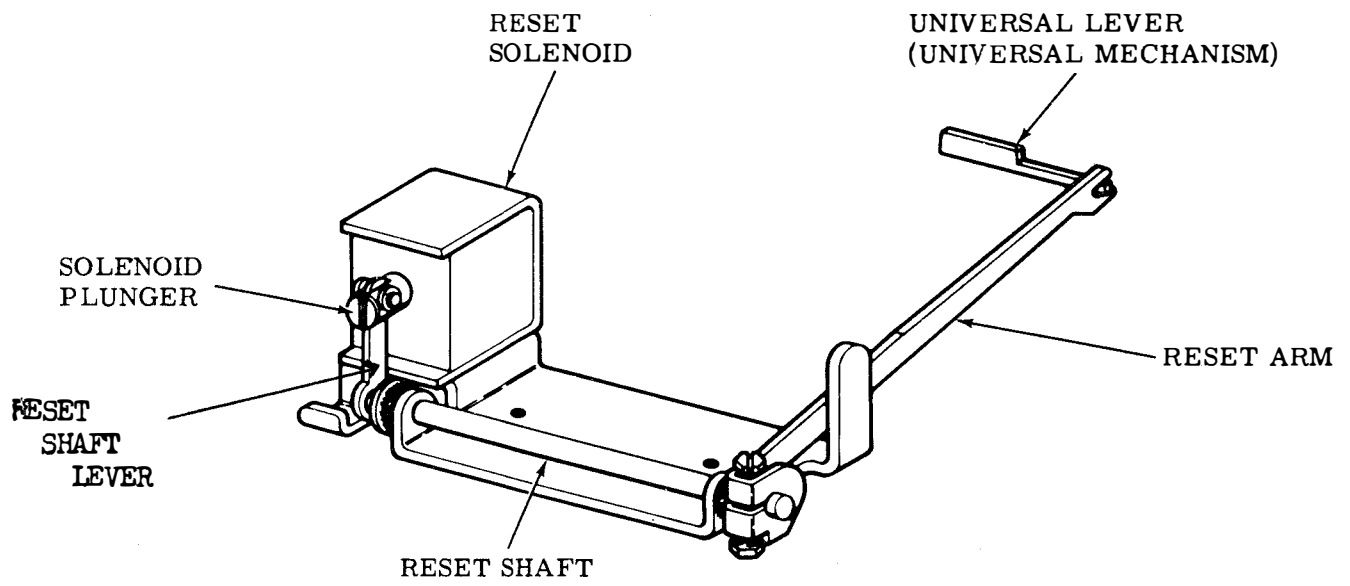
UNIVERSAL LEVER down and rotate the CONTACT RESET BAIL counterclockwise, moving the tops of the Contact Wires to the right.

When the UNIVERSAL LEVER moves below the

LATCH LEVER, the LATCH LEVER will rotate counterclockwise, and hold the

UNIVERSAL LEVER down in its normal stop position. The

NONREPEAT LEVER will be allowed to move down to normal stop position at the same time.



Reset Mechanism

OPERATION OF THE REPEAT MECHANISM

INTRODUCTION:

This information sheet describes the sequence of operation of the Repeat Mechanism.

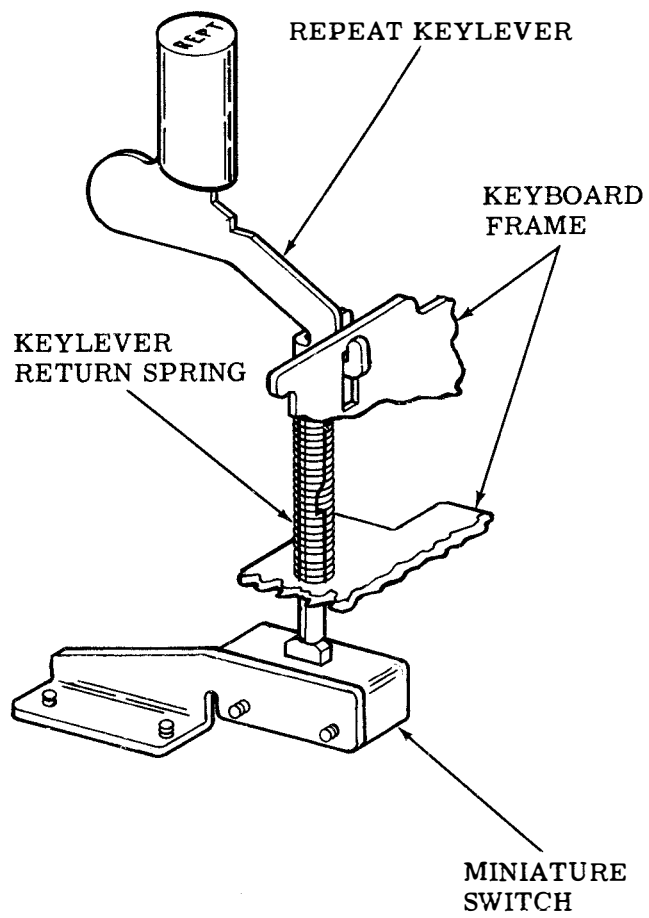
REFERENCE:

Bulletin 284B (NAVSHIPS 0967-059-9010), Technical Manual, Model 28 Compact Teletypewriter Sets, KSR and RO.

INFORMATION:

The repeat mechanism allows for the continuous selection of a character without having to depress the character key repeatedly.

The repetition of a character requires the continued rotation of the distributor clutch with no resetting action in the keyboard transmitter. The distributor clutch magnet circuit remains energized by bypassing the timing contacts with a circuit through the miniature switch. The timing contact bypass circuit maintains circuit continuity and allows the distributor clutch to continue to rotate. The reset circuit is opened by the miniature switch and keeps the reset solenoid from becoming energized. The keyboard transmitter will remain operated until the repeat key is released.



Repeat Mechanism

LOCAL FUNCTIONS

INTRODUCTION

This information sheet describes the sequence of operations of the local function. Local Line Feed and Local Carriage Return.

REFERENCE

Bulletin 284B (NAVSHIPS 0967-059-9010), Technical Manual, Model 28 Compact Teletypewriter Sets KSR and RO.

INFORMATION

The Local Line Feed Mechanism enables the platen to be rotated to advance the paper without disturbing other typing units on the Signal Line.

When the red

LOCAL LINE FEED FUNCTION KEY is depressed, the

LOCAL LINE FEED KEYLEVER moves down and into contact with the front end of the

LOCAL LINE FEED BAIL, rotating it clockwise (lt. vw.). The

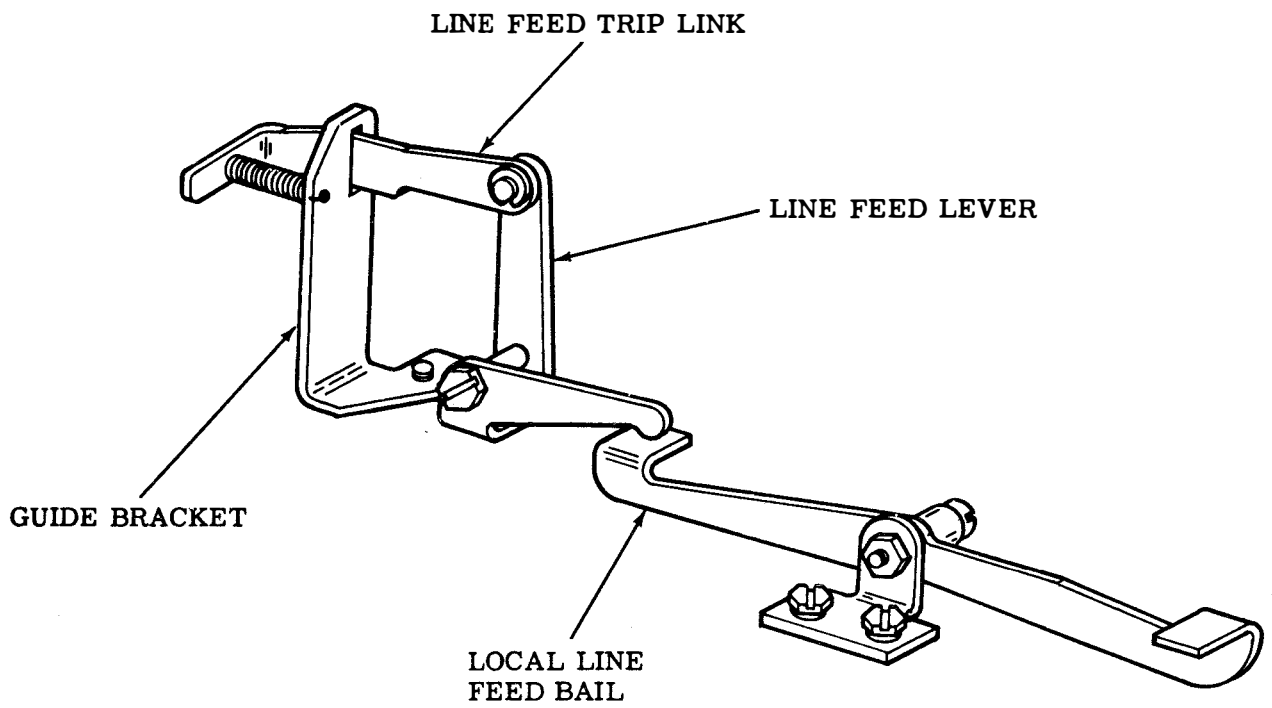
LINE FEED LEVER will move the

LINE FEED TRIP LINK to the rear and rotate the

LINE FEED CLUTCH TRIP LEVER on the automatic typer out of the path of the

LINE FEED CLUTCH SHOE LEVER, allowing the

LINE FEED CLUTCH to engage. The LINE FEED CLUTCH will remain engaged as long as the LOCAL LINE FEED KEY is depressed.



Local Line Feed Mechanism

The local carriage return enables the carriage to be locally returned without disturbing other typing units on the line.

When the

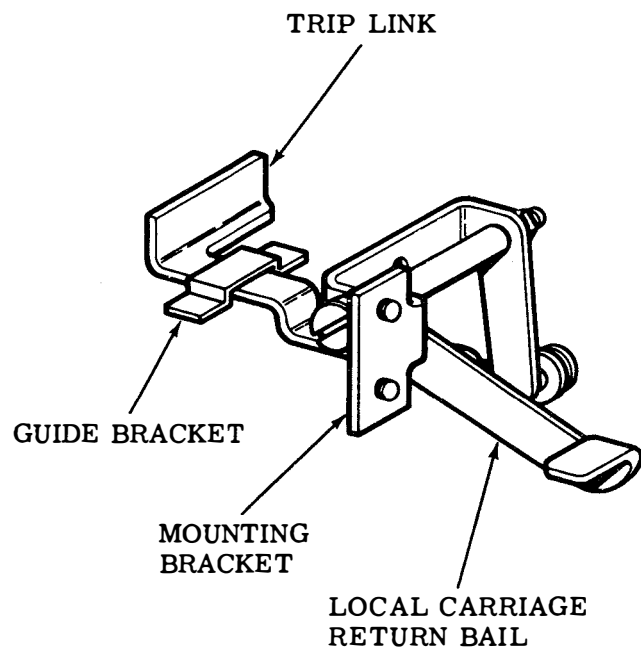
LOCAL CARRIAGE RETURN KEY is depressed the

LOCAL CARRIAGE RETURN KEYLEVER will move down and rotate the

LOCAL CARRIAGE RETURN BAIL clockwise (lt) and move the

CARRIAGE RETURN TRIP LINK to the rear where the

CARRIAGE RETURN LEVER, on the automatic typer, will be engaged and rotated clockwise (lt) causing carriage return.



Local Carriage Return Mechanism

TOPIC: DISTRIBUTOR

When you complete this topic, you will be able to:

STATE the Power Law for the Distributor as stated in the Trainee Guide.

STATE the purpose of engaging/disengaging the distributor clutch, NAME each part, and EXPLAIN the overall operation, including powers.

STATE the purpose of the cam sleeve assembly, NAME each part, and EXPLAIN the operation, including powers.

STATE the purpose of the distributor block assembly, NAME each part, and EXPLAIN the operation, including power.

STARTING THE ROTATION OF THE DISTRIBUTOR CLUTCH
AND THE DISTRIBUTOR CAM SLEEVE

INTRODUCTION:

This information sheet describes the sequence of operation of the distributor clutch and distributor cam sleeve.

REFERENCE:

Bulletin 284B (NAVSHIPS 0967-059-9010), Technical Manual, Model 28 Compact Teletypewriter Sets, KSR and RO.

INFORMATION:

The distributor clutch is engaged to rotate the cam sleeve which operates the distributor block assembly to control the distributor clutch trip magnet, the reset solenoid and apply signal line current to the keyboard transmitter.

The power law for the distributor; Cams on the distributor main shaft, the main shaft drive gear and springs throughout the distributor.

When the
DISTRIBUTOR CLUTCH TRIP MAGNET is energized by an AC pulse from the
CLUTCH TRIP CONTACT WIRE, it attracts the
DISTRIBUTOR CLUTCH TRIP ARMATURE which moves down in front. This
allows the
CLUTCH TRIP LEVER to rotate clockwise (rt) and move the
CLUTCH STOP LEVER out of the path of the CLUTCH SHOE LEVER, allowing the

DISTRIBUTOR CLUTCH (Regenerative type) to engage and rotate the DISTRIBUTOR CAM SLEEVE. The first cam to do work is the STOP CAM, which opens the STOP CONTACTS to cause the start impulse to be transmitted to the signal line.

This is followed by the

CLUTCH RESET CAM, which rotates the

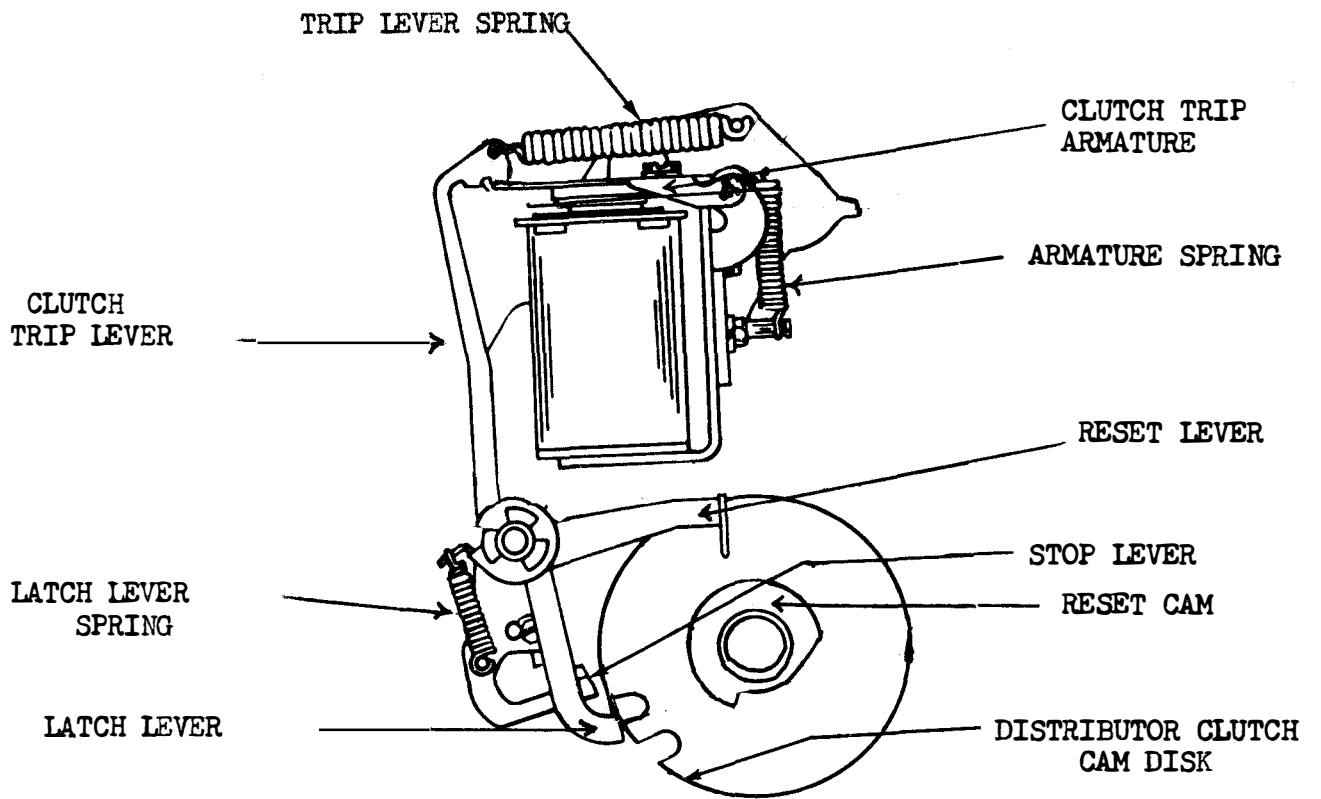
CLUTCH RESET LEVER and the CLUTCH TRIP LEVER counterclockwise (rt) moving the CLUTCH STOP LEVER back into the path of the CLUTCH SHOE LEVER. The top of the CLUTCH TRIP LEVER moves far enough to clear the front end of the CLUTCH TRIP ARMATURE and will remain there until the beginning of the Stop Impulse. When the timing contacts open, the CLUTCH TRIP MAGNET will deenergize and the front end of the CLUTCH TRIP ARMATURE will move up under the power of the

ARMATURE SPRING. When the CLUTCH TRIP LEVER moves to the rear, at the end of the rotation of the CAM SLEEVE, it will come into contact with the CLUTCH TRIP ARMATURE, and be held to the front of the machine and keep the Distributor Clutch disengaged.

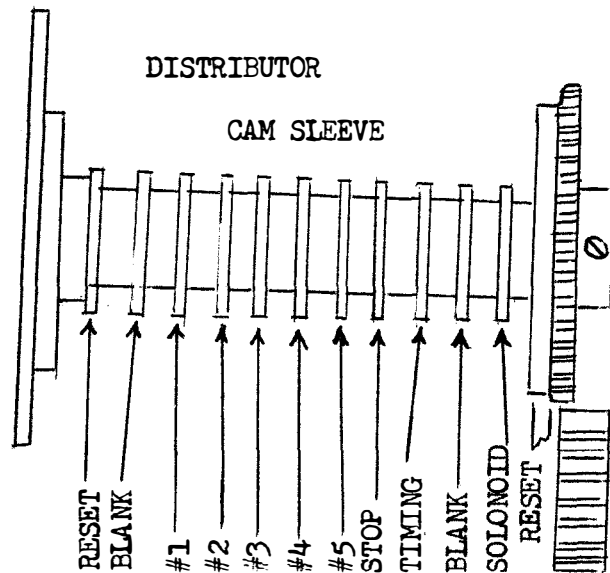
The pulse for the DISTRIBUTOR CLUTCH TRIP MAGNET is initiated by the CLUTCH TRIP CONTACT in the Keyboard Transmitter. The solenoid reset contacts will close and cause the Keyboard Transmitter to be reset during the fifth intelligence impulse.

There are eleven cams on the cam sleeve, and they are listed below in order, left to right:

CLUTCH RESET CAM
BLANK
#1 CODE LEVEL CAM
#2 CODE LEVEL CAM
#3 CODE LEVEL CAM
#4 CODE LEVEL CAM
#5 CODE LEVEL CAM
STOP CAM
CLUTCH MAGNET TIMING CAM
BLANK
SOLENOID RESET CAM



DISTRIBUTOR CLUTCH TRIP MECHANISM



OPERATION OF THE DISTRIBUTOR BLOCK ASSEMBLY

INTRODUCTION:

This information sheet describes the sequence of operation of the distributor block assembly.

REFERENCE:

Bulletin 284B (NAVSHIPS 0967-059-9010), Technical Manual, Model 28 Compact Teletypewriter Sets, KSR and RO.

INFORMATION:

The distributor block assembly shapes the teletype signal, applies signal line current to the keyboard transmitter, an AC pulse to the reset solenoid and deenergizes the clutch trip magnet circuit. The distributor contacts are linked in series with the keyboard transmitting contacts.

The high portion of the

STOP CAM rotates the

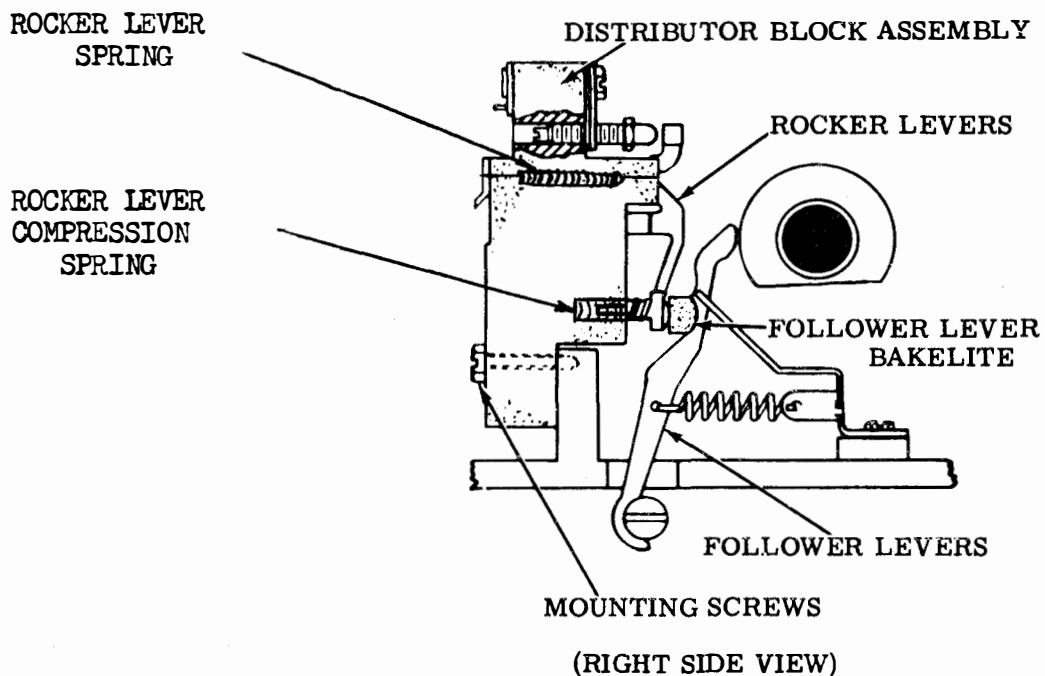
FOLLOWER LEVER counterclockwise (rt). The bakelite on the FOLLOWER LEVER comes into contact with the lower portion of the

ROCKER LEVER and rotates it clockwise (rt) moving the (normally closed) stop contacts apart, breaking the circuit. This causes the start impulse to be transmitted to the signal line. The STOP CONTACTS remain open during the time required for transmission of the intelligence pulses.

The five distributor contact rains of parts have FOLLOWER LEVERS and ROCKER LEVERS in the distributor block assembly. The low portion of the cams allow the FOLLOWER LEVERS to rotate clockwise (rt), the ROCKER LEVER COMPRESSION SPRINGS to rotate the ROCKER LEVERS counterclockwise (rt) and close the normally open DISTRIBUTOR CONTACTS. An impulse of current will be sent to the signal lines only if the respective CODE LEVEL CONTACT WIRE is in a marking condition (to the left).

Near the beginning of the rotation of the CAM SLEEVE the TIMING CAM will cause the TIMING CONTACTS to open and deenergize the CLUTCH TRIP MAGNET.

During the transmission of the fifth intelligence impulse, the SOLENOID RESET CONTACTS are closed to reset the UNIVERSAL LEVER in the keyboard transmitter. The contacts will open and terminate the pulse before the cam sleeve completes its rotation. When the fifth DISTRIBUTOR CODE LEVEL CONTACT opens, the STOP CAM allows the STOP CONTACT to close and re-establish the flow of current through the signal line.



DISTRIBUTOR BLOCK ASSEMBLY

SELF TEST ITEMS ON THE AN/UGC-20

INFORMATION

Answer the following questions in the space provided below each item. Refer to the Technical Manual and Trainee's Guide as necessary. Your work will be reviewed in the classroom by the instructor.

REFERENCE

Bulletin 284B (NAVSHIPS 0967-059-9010), Technical manual, Model 28 Compact Teletypewriter Sets KSR and RO.

QUESTIONS

1. What are the speeds of the machine using a 50 CPS motor?
2. What is the speed of the motor operated at 50 CPS?
3. What rotates the right T-lever CW? CCW?
4. Describe the operated position of a code bar submechanism for a mark?
5. What holds the T-levers in their operated positions?
6. What holds the universal lever down in the front?
7. What furnishes the power to move the rear bar down?
8. What furnishes the power to move the universal lever up?
9. What moves the universal code bar up?
10. When does the universal lever move down?
11. Which direction do the contact wires move for a space?
12. Can a second character be selected prior to the completion of transmission of the first character? Why?
13. Describe the operation to repeat a character in your own words?
14. What is the purpose of the line break T-lever?
15. What furnishes the power to move the local line feed key lever up?
16. What moves the clutch stop lever out of the path of the distributor clutch shoe lever?
17. Name the cams on the distributor cam sleeve.

TOPIC OBJECTIVES:

When you complete this topic, you will be able to:

SOLVE problems in basic electricity using Ohm's Law. The values of voltage, current and/or resistance will be indicated. All answers must be complete to two decimal places.

EXPLAIN the characteristics of electrical circuits, indicating direction of current flow, voltage drops, and operation of individual components, using the circuit diagrams.

STATE how a multimeter is properly connected to a circuit to measure voltage, resistance, and current. EXPLAIN the importance of observing polarity and interpreting meter readings accurately.

EXPLAIN the precautions necessary when working on a "LIVE" circuit, as listed in NAVSHIPS Technical Manual 9670.

REVIEW IN BASIC ELECTRICITY

INTRODUCTION:

The objective of this information sheet is to present a review of basic electricity as applied to simple series and parallel circuits.

INFORMATION:

Ohm's Law as applied to Basic Electricity.

The three components of Ohm's Law are:

- VOLTAGE (E) - The force that causes the electrons to move in a conductor - measured in volts (V).
- CURRENT (I) - The flow of electrons in a conductor - measured in amperes (amps) or a thousandth of an ampere called a milliampere (ma).
- RESISTANCE (R) - The opposition offered to the flow of current in a circuit - measured in ohms.

Ohm's Law Equations:

$$E = I \times R$$

$$I = E/R$$

$$R = E/I.$$

Series Circuits

The series circuit offers only one path for current flow. An open in one part of the circuit will stop current flow in all parts of the circuit.

The relationship of E, I and R in a series circuit is:

1. The sum of the voltage drops equals the applied voltage.
2. The current is the same in all parts of a series circuit.
3. Resistance is added to find the total resistance.

Parallel Circuits

Parallel circuits provide more than one path for current flow. Therefore, current divides according to the resistance of each leg of the circuit.

Voltage is the same across each leg of a parallel circuit.

OPERATION OF THE SIMPSON 269AF MULTIMETER

INTRODUCTION

The SIMPSON 269AF multimeter is a portable volt-ohm-milliamp-meter used to measure DC current, resistance and all types of voltages. The meter includes test probes, and a high voltage probe (not furnished at this school).

SAFETY PRECAUTIONS

The use of this equipment involves voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised when working on equipment employing high voltages.

Do not service or adjust equipment without the immediate presence of assistance of another person capable of rendering aid.

REFERENCE

T.O. No. 33A1-12-238-1 Instruction Manual for Volt-Ohm-Micro-Ammeter Model 269AF

INFORMATION

Description of the SIMPSON 269AF Multimeter

CONTROL KNOBS

There are two controls located on the front panel. They are as follows:

Range switch - a 24 position switch in the lower right corner used to select DC volts, AC volts, Output volts, DC ma or Amps, and various ranges of resistance.

Zero ohms - a control located in the lower left of the panel used to adjust the meter pointer to zero ohms when the Range switch is changed to a different range of resistance

SCALES

There are five scales on the meter. They are as follows:

Top scale - used to measure ohms and indicated zero to infinity from right to left.

Second scale from top - used to measure DC volts and current. The scale is numbered 0 to 160, 0 to 40 and 0 to 8 from left to right.

Third scale from top 0 used to measure AC volts. It is numbered 0 to 160, 0 to 40, and 0 to 8 from left to right

Fourth scale from top - used to measure AC volts 3 Volts and below. It is numbered 0 to 3 from left to right.

Bottom scale - used to measure Decibels -12V to 45.5 D.B.

MEASUREMENTS

The meter is designed for the following electrical measurements:

DC current up to 8 amperes
Resistance up to 200 megohms
DC voltage up to 4,000 volts
AC voltage up to 800 volts
Output voltage up to 160 volts

Operation of the SIMPSON 269AF

MEASURING RESISTANCE

Rotate the Range switch to the appropriate range.

0 to 2000 ohms, set Range switch to Rx1
0 to 20 k ohms, set Range switch to Rx10
0 to 200k ohms, set Range switch to Rx100
0 to 2 megohms, set Range switch to Rx1k
0 to 20 megohms, set Range switch to Rx10k
0 to 200 megohm, set Range switch to Rx100k

Caution - Ensure power is secured and circuit is isolated before proceeding further.

With the black test lead plugged into the COM jack and the red lead into the plus (+) jack, short the test probes together and adjust the zero ohms knob until the pointer reads 0 of the top scale.

After observing caution procedures above, place probes across the part of the circuit to be measured and observe the reading on the top scale.

MEASURING DC VOLTAGE

Rotate the Range switch to DCV. Caution: To protect the meter always start with highest scale and work down until meter reads Mid-scale.

With the black lead plugged into the COM jack and the red lead plugged into the plus (+) jack and observing the correct polarity, place the probes across the part of the circuit to be measured. The correct reading will be under the pointer on the second from top scale.

If a reverse deflection of the pointer is observed, reverse the test leads.

MEASURING DC AMPS OR MILLI-AMPS

Position the Range switch to DC position and to the appropriate scale. CAUTION: Always use the scale twice the highest of current expected to be present.

With the black lead plugged into the COM jack and the red lead plugged into the $\text{8A} +$ jack and observing the correct polarity place the probes in series with the leg of the circuit to be measured. The correct reading will be under the pointer on the second from top scale.

MEASURING AC VOLTAGE

Position the Range switch to ACV and to the appropriate scale. **CAUTION:** Always start with the highest scale and work down until the meter is reading mid-scale.

With the leads plugged into the COM jack and the plus (+) jack, place the probes across the part of the circuit to be measured and observe the correct reading under the pointer on the third from top scale. Since AC is not polarized the red and black leads may be interchanged without causing the meter to read backwards.

If the AC voltage present is below $3V$, position the Range switch to the proper scale and observe the reading on the bottom scale.

Safety of Operation

Place multimeter in a safe operating position, avoiding the edge of workbench, desk, etc.

When in doubt of the value to be checked, start with the highest scale and work down until meter reads mid-scale.

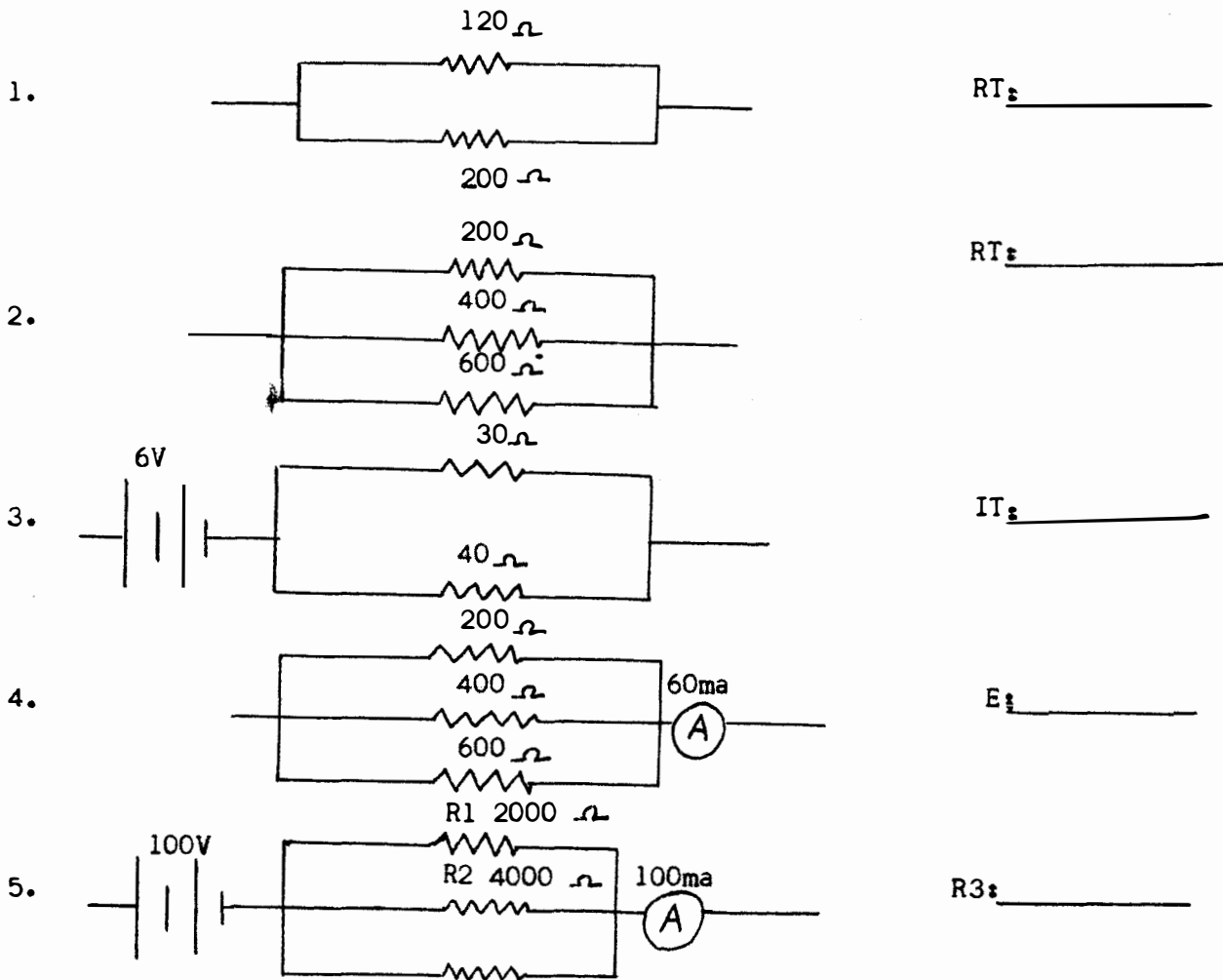
Double check position of switches before making measurements. Placing the test probes across circuit when the switches are positioned incorrectly may cause the multimeter to be damaged.

SELF TEST ITEMS ON THE MODEL AN/UGC-20

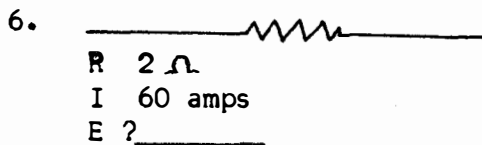
DIRECTIONS

Work the electrical circuit problems and answer the questions. Place your answers on the answer sheet provided. Refer to the Technical Manual and Trainee's Guide as necessary. Your work will be reviewed in the classroom by the Instructor.

PARRALLEL CIRCUIT PROBLEMS



SERIES CIRCUIT PROBLEMS



7.



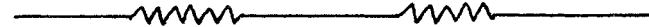
R 2
 E 120V
 I ? _____

8.



E 120V
 I 60 amps
 R ? _____

9.



ET 120V
 IT 60 ma
 RT ? _____

10.



120V
 R1 500 Ω
 I1 60 ma
 R2 1500 Ω

E1? _____

E2? _____

11. What electrical charge do electrons possess?
12. What are materials called that impede the flow of electrons?
13. In what direction does current flow?
14. What is a series circuit?
15. What is a parallel circuit?
16. In a parallel circuit, what determines the amount of current to be found in each individual leg?
17. What is the total resistance of a series circuit containing resistors of 20, 80, and 100 ohms?
18. What is the total resistance in a parallel circuit containing 20, 80, and 100 ohms?
19. When using the SIMPSON 269AF to measure DC voltages, what color is the lead connected to the negative terminal?
20. What precautions should be observed when measuring resistance with the SIMPSON 269AF multimeter?

ELECTRICAL COMPONENTS

TOPIC OBJECTIVES

When you complete this topic you will be able to:

LOCATE and STATE the purpose of the electrical components of the AN/UGC-20, NAME the designation of each component and EXPLAIN the operation of each.

NAME and LOCATE the various switches and controls associated with the electrical components, and EXPLAIN their uses and effects upon the different modes of operation.

INTRODUCTION

This information sheet is to show the location of the electrical components.

REFERENCE

Bulletin 2R4B (NAVSHIPS 0967-059-9010), Technical Manual, Model 28 Compact Teletypewriter sets - KSR and RO.

INFORMATION

Components mounted on the Keyboard Transmitter, Inner Base and Cabinet (with corresponding symbols).

SYMBOLS

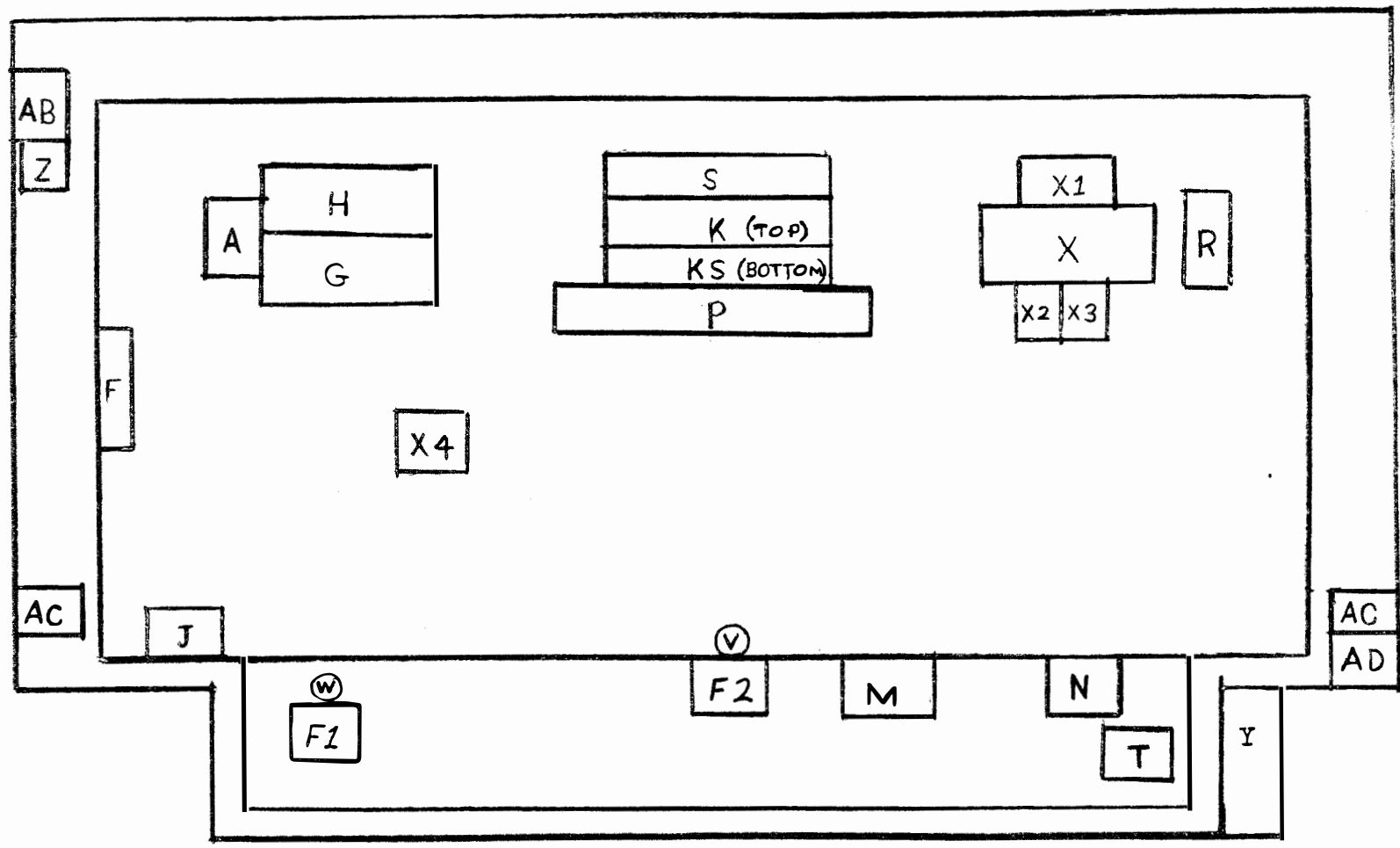
COMPONENTS

A	Distributor Clutch Magnet
AB	Copylight Transformer
AC	Copylights -5.5VAC
AD	Margin Indicator Neon Light
F	Base Connector - 24 Receptacles
F1	4-amp Slow Blow Fuse
F2	1-amp
G	Distributor Contacts (8 sets of contacts)

H	Terminal Block (4 Terminals)
J	Margin Indicator Switch
K	Terminal Block (4 Terminals)
KS	Spare Terminal Block (4 Terminals)
M	Reset Solenoid
N	Power Switch
P	Terminal Block (6 Terminals)
R	Base Connector (20 Receptacles)
S	AC Input Terminal Block (4 Terminals)
T	Repeat Switch
V	Tie Points for Fuse (F2, 1 amp)
W	Tie Points for Fuse (F1, 4 amp SloBlow)
X	Motor
X1	Thermal Cut-out Switch
X2	Motor Start Relay
X3	Motor Start Capacitor
X4	Motor Stop Switch
Y	Keyboard Contacts
Z	Plug Connector to Cabinet

LOCATION OF ELECTRICAL COMPONENTS AN/UGC-20

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A. C. CIRCUIT ANALYSIS

TOPIC OBJECTIVES

When you complete this topic you will be able to:

ANALYZE AC circuit diagrams associated with the AN/UGC-20, IDENTIFY Various circuits on the circuit diagram, LOCATE check points, and DENOTE voltages, current and resistance.

INTERPRET simulated voltage and resistance values of the circuit under analysis using the circuit diagrams to determine the defective current and/or equipment.

INTRODUCTION

This information sheet is to show the components and operation of the various A.C. circuits and is to be used in conjunction with the A.C. circuit diagram.

REFERENCE

Bulletin 284B (NAVSHIPS 0967-059-9010), Technical Manual, Model 28 Compact Teletypewriter sets - KSR and RO.

INFORMATION

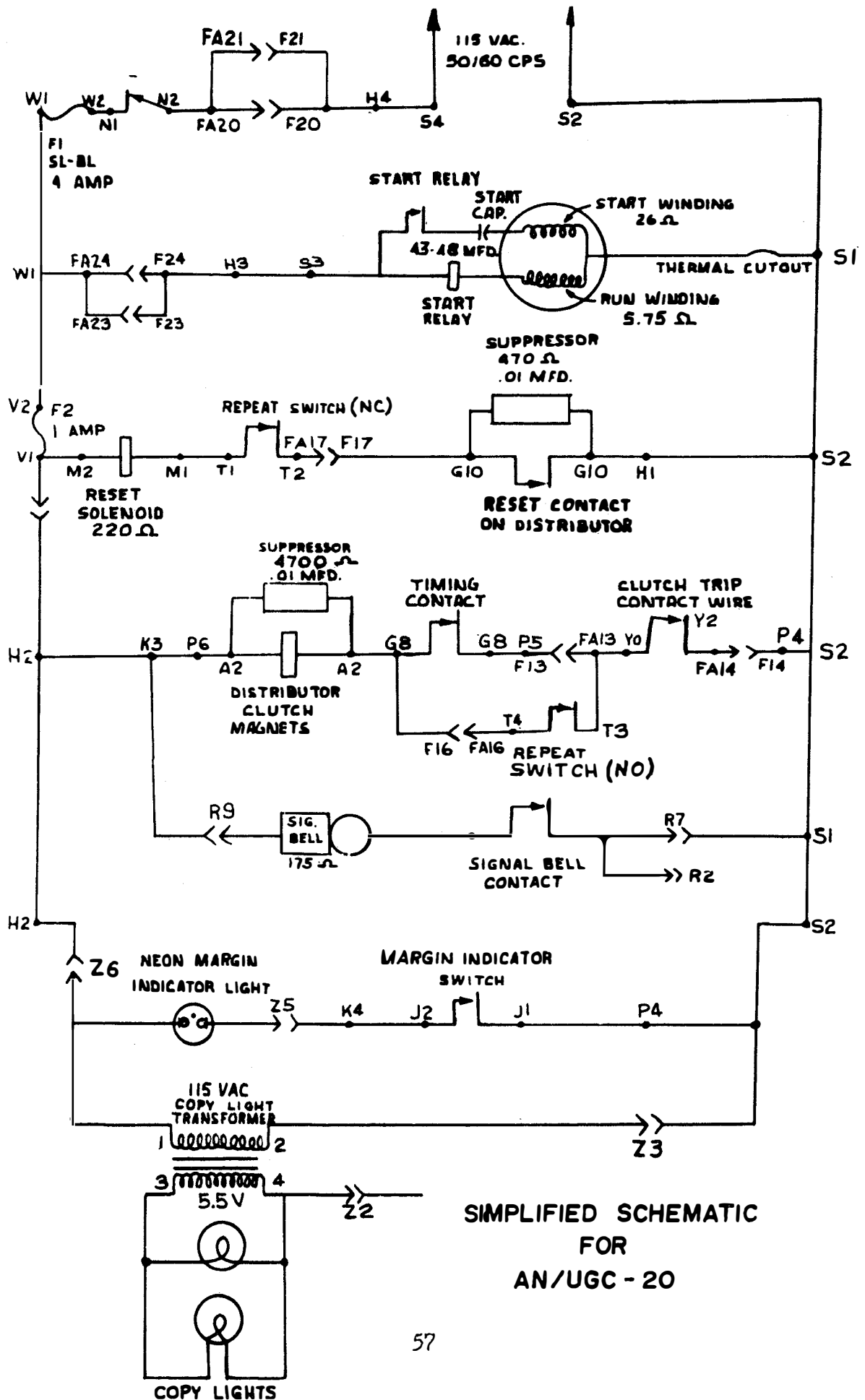
The AC portion of the machine requires 115 volts 50 or 60 cycles per second.

The master fuse, F1 rated at 4 amp SL-BL, is located on the keyboard. A second fuse, F2 rated at 1 amp, is located in the rear of the keyboard and protects all circuits except the motor circuit.

There are six AC circuits in the AN/UGC-20. These circuits are listed with an explanation of their functions. For the actual composition of these circuits refer to the schematic diagram.

1. **MOTOR CIRCUIT:** The motor circuit consists of the motor and a thermal cutout switch to protect the motor from overheating. This circuit also contains a start relay, start capacitor and start winding, all used in starting the motor.
2. **RESET SOLENOID CIRCUIT:** The reset solenoid circuit consists of the reset solenoid on the keyboard and the reset contact on the distributor. It is used in resetting the universal lever.

3. **DISTRIBUTOR CLUTCH TRIP MAGNET CIRCUIT:** The clutch trip magnet circuit consists of the distributor clutch trip magnet, the timing contacts and the clutch trip contacts. This circuit is used to release the distributor clutch. The timing contacts are normally closed, and the clutch trip contacts normally open. When the clutch trip contacts close the clutch trip magnet is energized and will deenergize at the beginning of the rotation of the cam sleeve when the timing contacts open. This will deenergize the clutch trip magnet and allow the clutch to be disengaged. Should the repeat key be depressed the timing contact will be bypassed through the repeat switch and the clutch will not be allowed to disengage, and the character will be repeated.
4. **SIGNAL BELL CIRCUIT:** The signal bell is an AC operated magnetic coil device and included in its circuit is a contact assembly which is normally open except when affecting a signal bell function.
5. **MARGIN INDICATOR LIGHT CIRCUIT:** The margin indicator light circuit consists of a switch and a neon bulb. The cam disk on the spring drum is adjusted so that the margin indicator lamp will turn on at the 66th, 67th, or 68th character.
6. **COPY LIGHT TRANSFORMER CIRCUIT:** The copy light transformer circuit consists of a step down transformer (115V to 5.5V) which has AC supplied as long as the main power switch is on. The secondary of the transformer contains two 5.5 volt lamps in parallel.
7. **REPEAT SWITCH:** A repeat switch utilizing a double set of contacts is incorporated in both the reset solenoid and distributor clutch trip magnet circuit. This switch, when operated, will open the reset solenoid circuit and bypass the timing contacts in the distributor clutch trip magnet circuit. Although the timing contacts will open at their normal time, a path for current flow will be provided by the closed set of contacts in the repeat switch and the distributor clutch trip magnet circuit will remain energized.



SIMPLIFIED SCHEMATIC
 FOR
 AN/UGC - 20

D.C. CIRCUIT ANALYSIS

TOPIC OBJECTIVES

When you complete this topic, you will be able to:

ANALYZE D.C. circuit diagrams associated with the AN/UGC-20, IDENTIFY various circuits on the circuit diagrams LOCATE check points, and DENOTE voltage, current and resistance.

INTERPRET simulated voltage and resistance values in the circuit under analysis, using the circuit diagrams to determine the defective circuit and/or equipment.

INTRODUCTION:

This information sheet is to show the components and the operation of the D.C. circuits and is to be used in conjunction with the D.C. circuit diagram.

REFERENCE:

Bulletin 284B (NAVSHIPS 0967-059-9010), Technical Manual, Model 28 Compact Teletypewriter sets, KSR and RO.

INFORMATION:

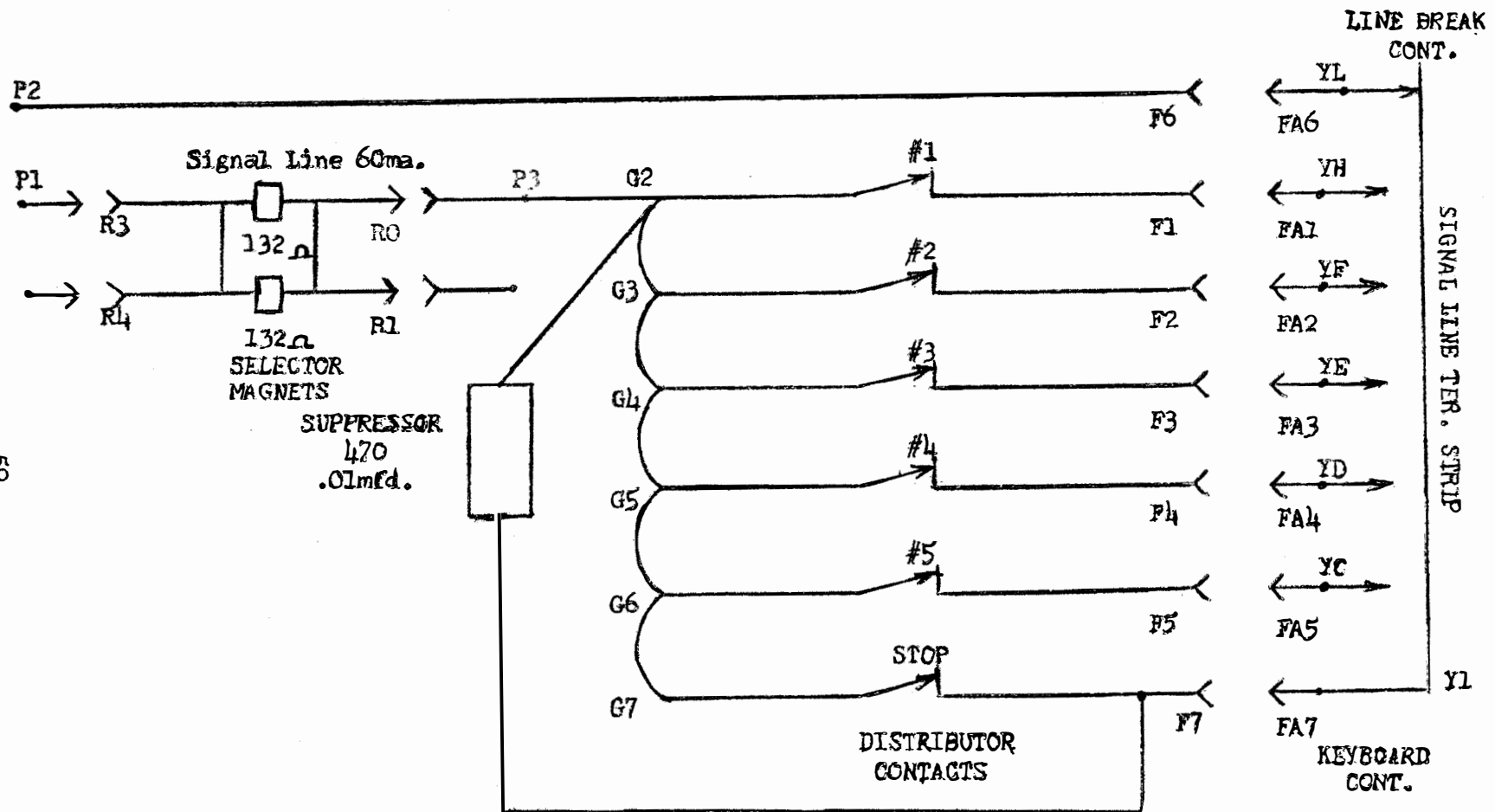
The AN/UGC-20 has no power supply to provide signal line current (60 ma. DC). Current must be supplied by an external source.

The selector magnets are connected in parallel for 60 ma operation (High-Level Keying). When shifting to 20 ma operation (Interim Low-Level Keying), the selector magnets must be connected in series.

The path of current flow from the incoming signal line is through terminal P2, the Line Break contacts, the selected keyboard transmitter contact wire, the D.C. terminal strip, the distributor contacts and then to G2. It then flows through P3, the selector magnets, and on to P1.

A capacitor positioned across the distributor contacts prevents the contacts from arcing and reduces electrical radiation.

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SIMPLIFIED D.C. CIRCUITS (NORMAL STOP CONDITION)

REFERENCE:

NAVSHIPS 0967-059-9010, Section 573-115-100, Pages 10-13.

INFORMATION:

The main shaft is located in the lower rear portion of the automatic typer and extends the length of the unit. It is supported by ball type bearings mounted in each side frame. When the automatic typer is mounted in the base unit, the main shaft helical driving gear on the main shaft meshes with the typing unit drive gear in the 3-speed gear shift assembly. Thus, motive force is extended from the motor to the main shaft which in turn, drives the automatic typer. The main shaft also contains the spacing shaft helical driving gear and the line feed clutch spur gear.

The main shaft carries six (6) clutches, each of which, when tripped, drives its associated mechanism. These clutches are of the regenerative type and have two shoes which bear against the surface of a drum, which, in turn is keyed to the main shaft. Two of these clutches have three sets of lugs equally spaced about their periphery for controlling the engagement and disengagement of the clutch shoes with the drum. Thus, these clutches have the ability to turn only one third of a revolution when tripped. The remaining clutches have one set of lugs and must turn one complete revolution when tripped.

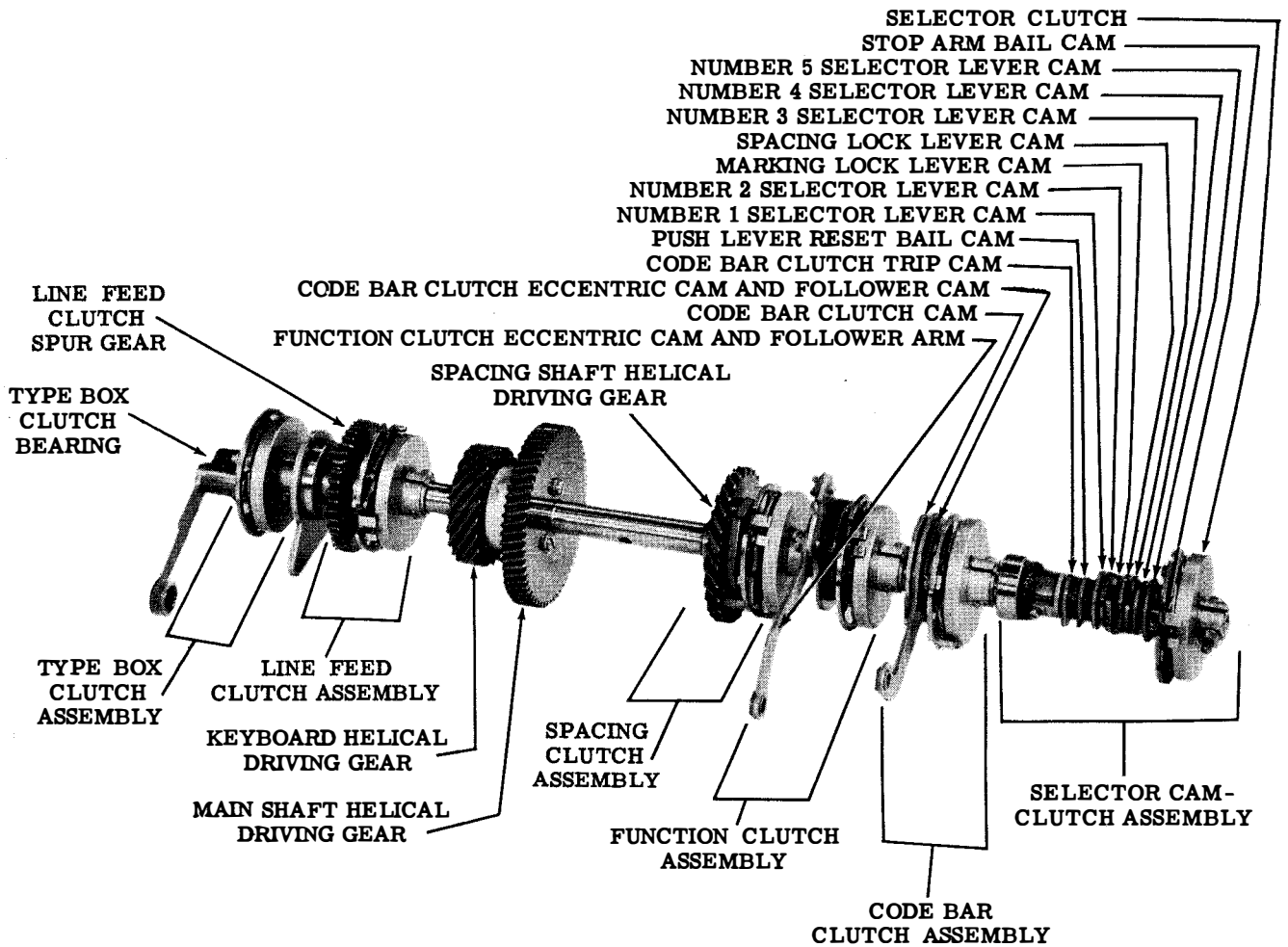
The gears, clutches and cams will be discussed in detail as each of the operations to which they are related is presented.

The main shaft clutches are designated from right to left as follows:

SELECTOR CLUTCH	-	ONE STOP
CODE BAR CLUTCH	-	ONE STOP
FUNCTION CLUTCH	-	ONE STOP
SPACING CLUTCH	-	THREE STOP
LINE FEED CLUTCH	-	THREE STOP
TYPE BOX CLUTCH	-	ONE STOP

The power law for the automatic typer is as follows:

Power for the automatic typer is derived from cams, gears, eccentrics and the type box clutch on the main shaft and springs throughout the automatic typer.



MAIN SHAFT ASSEMBLY

TOPIC: OPERATION OF THE THREE SPEED GEAR SHIFT MECHANISM

TOPIC OBJECTIVES:

When you complete this lesson, you will be able to:

STATE the purpose of the three speed gear shift mechanism, NAME each part, and EXPLAIN the overall operation.

INTRODUCTION:

This information sheet describes the sequence of operation of the three speed gear shift mechanism.

REFERENCE:

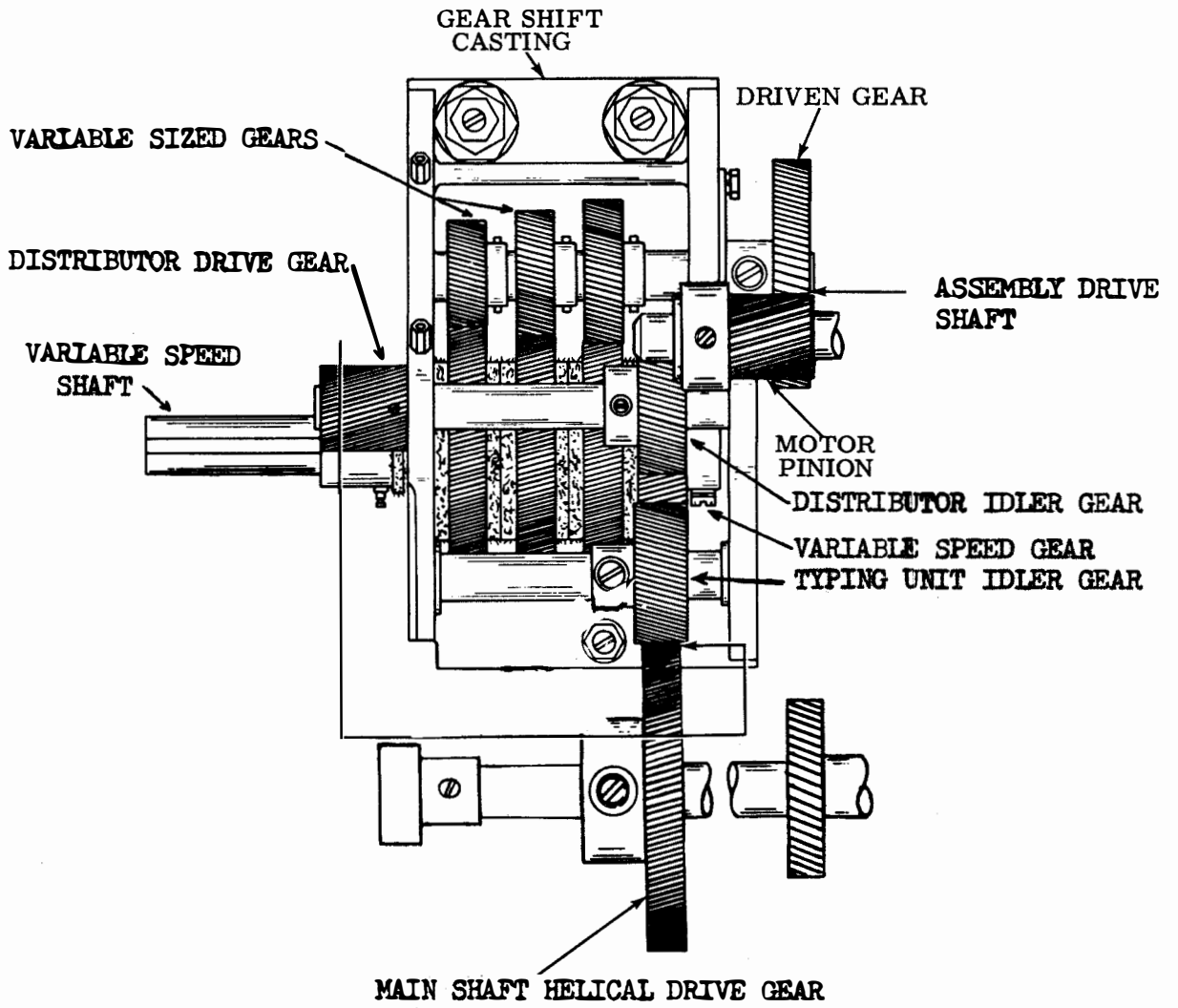
Bulletin 284B (NAVSHIPS 0967-059-9010), Technical Manual, Model 28 Compact Teletypewriter Sets, KSR and RO.

INFORMATION:

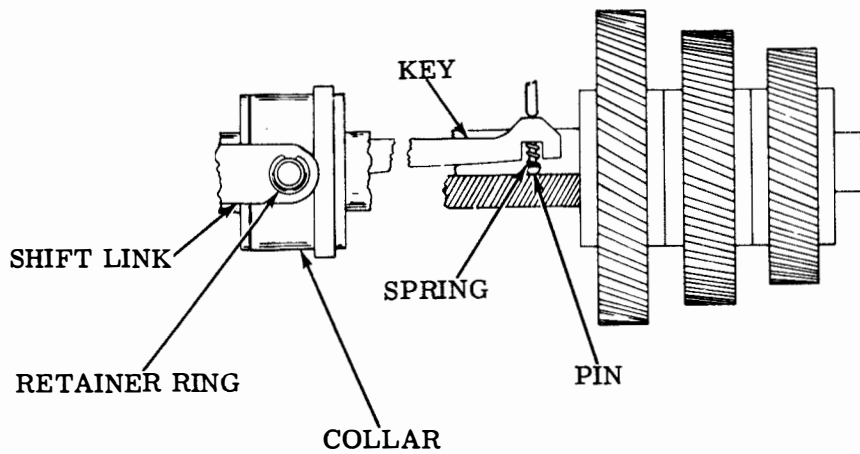
The three speed gear shift mechanism transfers rotational motion from the motor to the distributor mechanism (KSR only) and the typing unit. The output speed can be changed while the motor is either running or stopped.

THREE VARIABLE SIZED GEARS are mounted on the assembly drive shaft, which rotates at a constant speed. These gears mesh with DIFFERENT SIZED VARIABLE SPEED GEARS, located on the VARIABLE SPEED SHAFT. A SLIDING KEY attached to the COLLAR and riding in the variable speed shaft slot, connects one of the THREE VARIABLE SPEED GEARS to the variable speed shaft. The VARIABLE SPEED SHAFT SPUR GEAR meshes with the DISTRIBUTOR SHAFT IDLER GEAR and rotates the distributor idler shaft. The distributor idler shaft rotates the DISTRIBUTOR DRIVE GEAR and supplies motion to the DISTRIBUTOR IDLER GEAR. The DISTRIBUTOR IDLER GEAR rotates the DISTRIBUTOR MAIN SHAFT DRIVE GEAR. The TYPING UNIT DRIVE GEAR is also meshed with the VARIABLE SPEED SHAFT SPUR GEAR and drives the MAIN SHAFT HELICAL DRIVING GEAR.

The selector on the front left portion of the machine operates a SHIFT LINK to select one of the three speeds. The SHIFT LINK positions the COLLAR and SLIDING KEY to engage the single gear ratio with the variable speed shaft for the desired speed.



3 SPEED GEAR ASSEMBLY



STARTING THE SELECTOR CAM CLUTCH, RANGE FINDER AND DISTORTION

INTRODUCTION:

The purpose of this information sheet is to teach the operation involved with starting the selector cam clutch, types of distortion the operation of the range finder, and points of range and optimum setting, using correct terminology.

REFERENCE:

NAVSHIPS 0967-059-9010, Section 573-115-100, Pages 13-17.

INFORMATION:

To start the
SELECTOR CAM CLUTCH ASSEMBLY rotating, a
START IMPULSE (space) is received. The
SELECTOR ARMATURE, under tension of the
SELECTOR ARMATURE SPRING, moves away from the
MAGNET CORES, and allows the
START LEVER, under the tension of its spring, to move to the rear
taking with it the
STOP ARM BAIL, which goes into the indent of the
STOP ARM BAIL CAM. As the STOP ARM BAIL rotates about its pivot point,
the attached
STOP ARM is moved out of engagement with the
SELECTOR CAM CLUTCH SHOE LEVER, allowing the primary and secondary shoes
to engage the serrated edge of the
SELECTOR CAM CLUTCH DRUM, starting the SELECTOR CAM CLUTCH ASSEMBLY
rotating. The
STOP ARM BAIL immediately rides to the high part of its cam where it
remains to hold the
START LEVER away from the SELECTOR ARMATURE during the signaling time.
To stop the rotation of the SELECTOR CAM CLUTCH ASSEMBLY the
STOP IMPULSE (mark) is received. The

SELECTOR ARMATURE is pulled up to block the
START LEVER, which prevents the
STOP ARM BAIL from dropping into the low part of its cam, thus holding
the attached
STOP ARM in the path of the
CLUTCH SHOE LEVER, and disengaging the clutch which stop the rotation
of the SELECTOR CAM CLUTCH ASSEMBLY.

Distortion

An ideal teletypewriter circuit reproduces signals at the receiving end exactly as they are impressed at the sending end. Unfortunately, this seldom happens under actual operating conditions. Signal units have a way of lengthening and shortening as they travel along the circuit. This lengthening and shortening of marks and spaces which occurs during transmission reduces the quality of the signal, and is called distortion.

The following are three fundamental types of distortion which adversely affect the fidelity of teletypewriter signals.

Bias Distortion

Bias distortion is the uniform lengthening or shortening of the mark or space elements, one at the expense of the other. This means that the total time for one mark and one space never changes, only the length of the mark or space element, changes. If the mark is lengthened, the space is shortened by the amount the mark is lengthened. Bias distortion receivers, or a drift in frequency of either the transmitter or receiver.

Characteristic Distortion

Characteristic distortion is a repetitive displacement or disruption peculiar to specific portions of the signal. It normally is caused by maladjusted contacts of the sending equipment. An example would be the repeated distortion of the third code element of a teletypewriter signal.

Fortuitous Distortion

Fortuitous distortion is the random displacement or breaking up of the mark and space elements. It is caused by cross-talk interference between circuits, atmospheric noise, power line induction, poorly soldered connections, lightning storms, dirty keying contacts, and such similar disturbances. It differs from characteristic distortion in that it is random instead of repetitive.

Range Finder

All teletype receivers are equipped with a range finder. In every case, the function of the range finder is

to orient the mechanical selector to the electrical signal to obtain maximum selecting margins. When the

RANGE FINDER KNOB is pushed in and rotated, its attached

RANGE FINDER GEAR moves the

RANGE FINDER SECTOR (which serves as a mounting for the STOP ARM BAIL, STOP ARM, and LATCH LEVER) either clockwise or counterclockwise (as viewed from the right) about the SELECTOR CAM CLUTCH. This changes the angular position at which the SELECTOR CAM CLUTCH stops with respect to the selector levers.

When the optimum setting is obtained, the

RANGE FINDER KNOB is released. Its inner teeth engage the teeth of the INDEXING LOCK STUD to lock the

RANGE FINDER INDEX MECHANISM in position, the setting may be read on the

RANGE SCALE opposite the fixed

INDEX MARK.

RANGE

The selecting interval of the impulse (ie. when the actual selection is made) is 20% of the pulse width of 4.4 m/s at 60 WPM. Therefore a perfect selector should be able to tolerate 40% distortion of both leading and trailing edges.

POINTS OF RANGE

To determine the points of range, the range finder is adjusted to the two extreme positions - at the lower and upper end of the range scale.

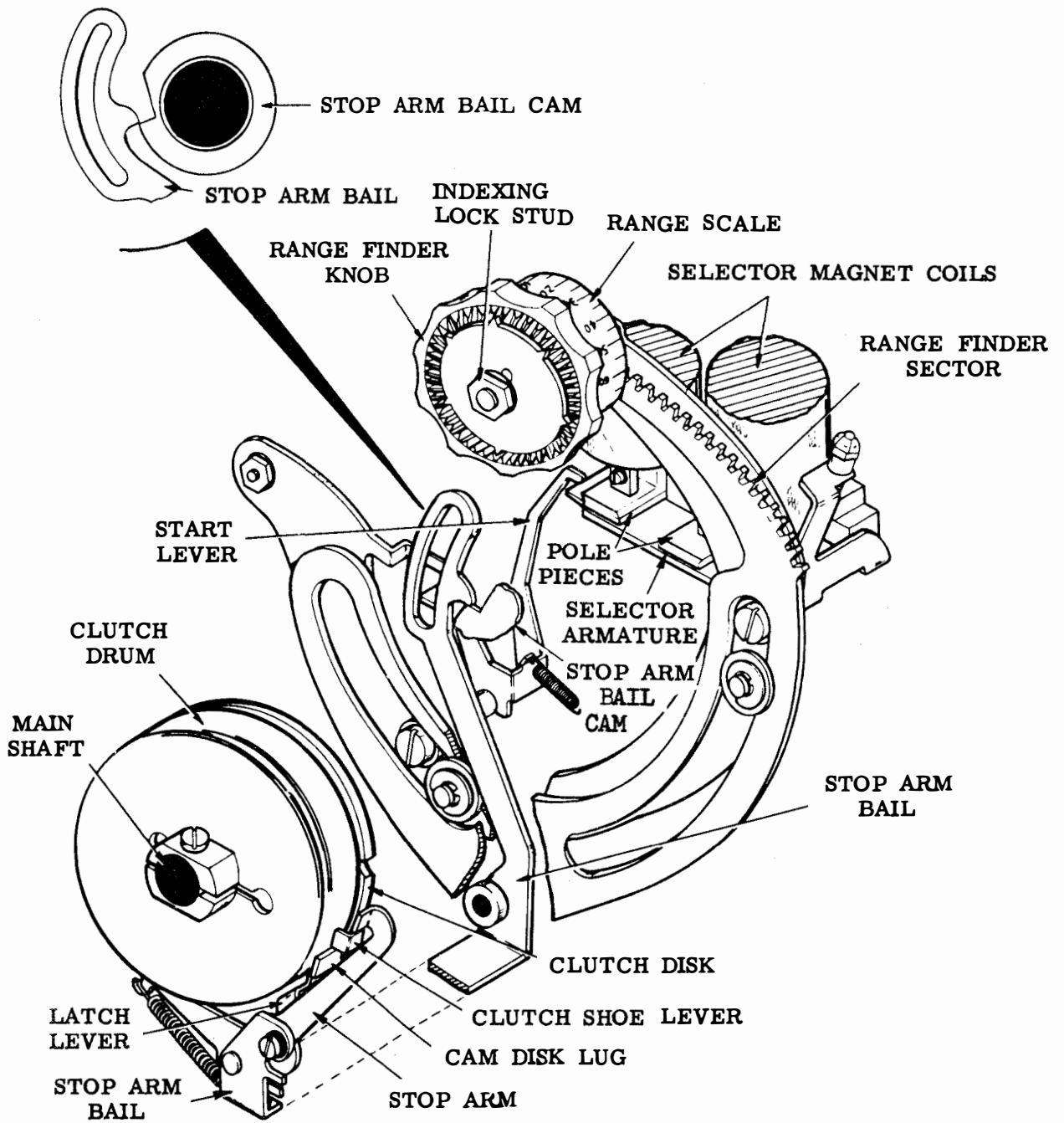
In each position, observations are made of the typed record and a reading on the range scale is taken when about one error is typed per line of copy. This means about one error in 69 characters.

After the high and low limits are found on the range scale, subtract the low limit from the high limit and this will give the point of range.

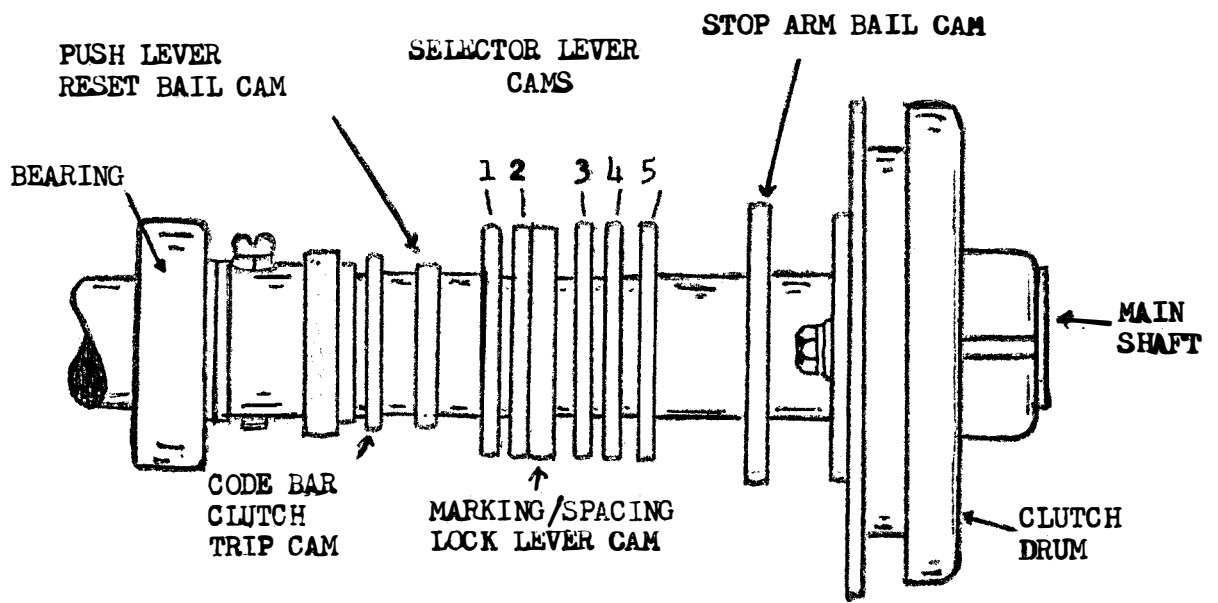
Optimum Setting

The object is to place the selection interval on the best usable portion of the signal that will give the selecting mechanism a maximum margin of safety.

With the selection point ~~midway~~ between the transition, there is the least chance of error. ~~This is~~ known as the optimum setting. To find the optimum setting add the high side and the low side of the usable range and divide by 2.



Selector Clutch and Range Finder



SELECTOR CAM SLEEVE ASSEMBLY

POSITIONING PUSH LEVERS, TRANSFER LEVERS,
AND CODE BAR SHIFT BARS

INTRODUCTION

The objective of this information sheet is to present the operation of positioning the push levers, transfer levers and the code bar shift bars using correct terminology.

REFERENCE

Navships 0967-059-9010, ISS I, Section 575-115-100 Pages 13-18

INFORMATION

Positioning Push Levers, Transfer Levers and Code Bar Shift Bars

As viewed from the right, when a marking impulse is received, the magnets are energized and attract the armature; both the

MARKING and SPACING LOCK LEVERS try to go to the low side of their cam. The

SPACING LOCK LEVER is blocked by the

SELECTOR ARMATURE and the MARKING LOCK LEVER will rotate CW by its own spring, locking the SELECTOR ARMATURE in a marking position. The

MARKING LOCK LEVER EXTENSIONS permit all of the SELECTING LEVERS, moved by their own springs, to rotate CW against their cams. When the indents of the cams present themselves to their respective SELECTING LEVERS, the

SELECTING LEVERS will move to the low side allowing their respective

PUSH LEVERS to be rotated CW by their own springs into the notch of the

SELECTING LEVERS. The SELECTING LEVERS will come out of the low portion of its cam back to the front of its normal position. During the 5th Intelligence pulse all the SELECTING LEVERS rotate CCW riding to the high side (common to all selecting cams) positioning the PUSH LEVERS to the front striking the

INTERMEDIATE ARMS rotating them CCW. Riding in the open end of the INTERMEDIATE ARMS are the lower portion of their respective

TRANSFER LEVERS which are connected to the INTERMEDIATE ARMS through the medium of a dual purpose spring now called the

TRANSFER LEVER SPRINGS. The TRANSFER LEVER SPRINGS rotate the TRANSFER LEVERS bottom to the front, top to the rear CW moving their respective

CODE BAR SHIFT BARS to the rear. Viewing the typer from the front, the CODE BAR SHIFT BARS move top to the rear for a mark.

As viewed from the right when a spacing impulse is recieved, as the SELECTOR ARMATURE is pulled away from the magnet cores by its own spring, the

SPACING LOCK LEVER is rotated CW by its own spring and locks the SELECTOR ARMATURE in a spacing position and the

MARKING LOCK LEVER is blocked.

MARKING LOCK LEVER EXTENSIONS prevent the SELECTING LEVERS from going against their cams. Thus, the CODE BAR SHIFT BARS remain to the left (as viewed from the right side). As viewed from the front the CODE BAR SHIFT BARS remain forward.

As viewed from the right, to strip the PUSH LEVERS during the start impulse of the next character, the arm of the

PUSH LEVER RESET BAIL rides to the high portion of its cam, rotating the

PUSH LEVER RESET BAIL counterclockwise which in turn strips the

PUSH LEVERS out of the notches in the

SELECTING LEVERS, allowing the

PUSH LEVER SPRINGS to pull the PUSH LEVERS to the rear, moving away from their

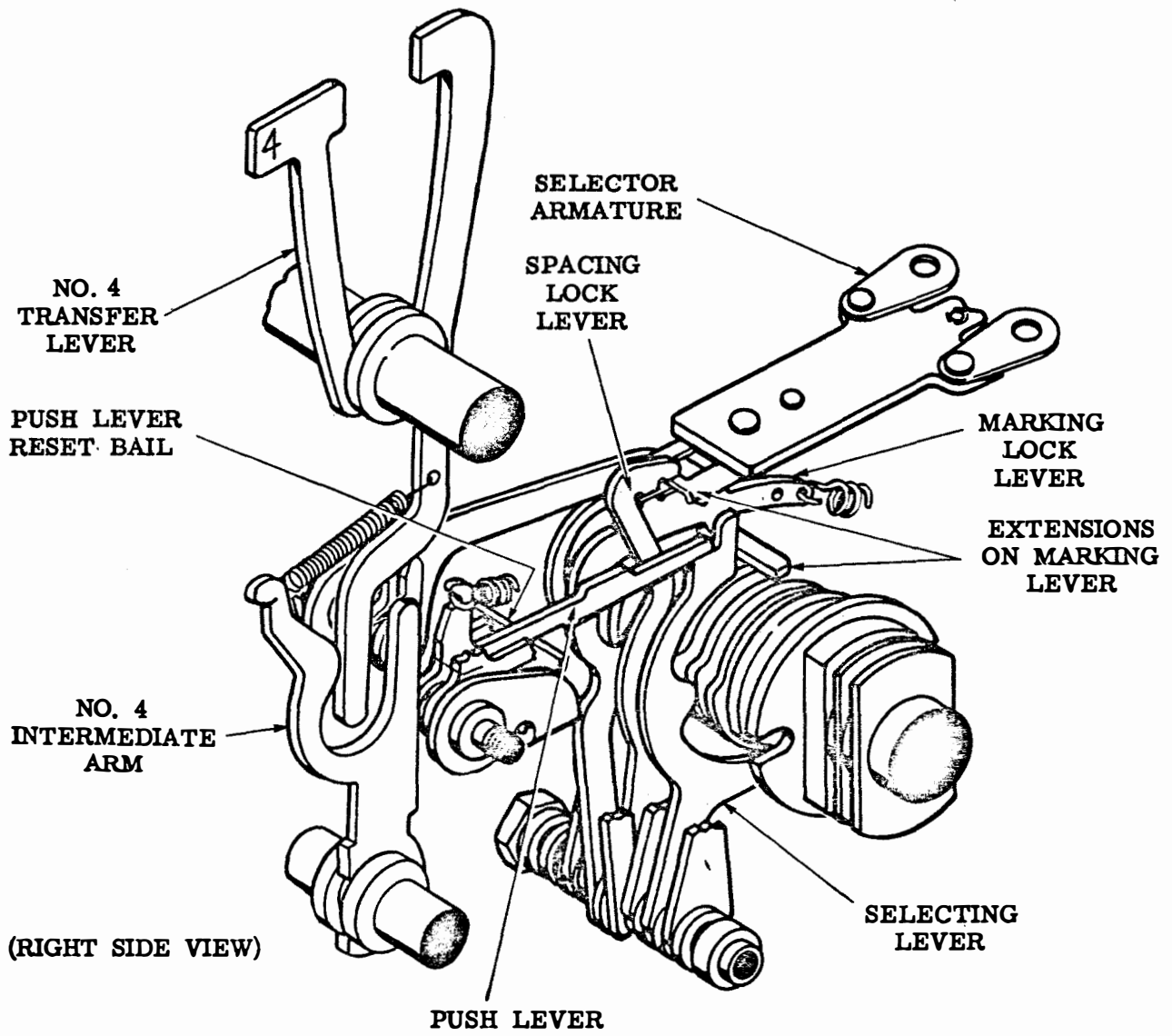
INTERMEDIATE ARMS which are rotated CW by the dual purpose springs now called the

TRANSFER LEVER SPRINGS. The

INTERMEDIATE ARMS come in contact with the

TRANSFER LEVERS and will rotate the TRANSFER LEVER CCW, bottom to the rear, top to the front. The top of the TRANSFER LEVERS will move the

CODE BAR SHIFT BARS to the front ready to be positioned for the next character.



Selecting Mechanism and Transfer Mechanism

SELF-TEST ITEMS ON THE MODEL AN/UGC-20

DIRECTIONS

Answer the following questions and place you answers on this sheet. Refer to the Technical manual and the Trainee's Guide as necessary. Your work will be reviewed in the classroom by the instructor.

REFERENCES

Navships 0967-059-9010, Volume I, Technical Manual Model 28 compact automatic Send-Receive KSR Teletypewriter Sets.

QUESTIONS

1. State the power law for the automatic typer.
2. Name the three-stop clutches on the main shaft starting from left to right.
3. As viewed from the left, when the start lever is rotating CW, in which direction will the stop arm bail be moving?
4. What holds the start lever to the front of the machine during intelligence signaling time?
5. Name the cams on the selector cam clutch assembly in order, starting with the most outboard cam.
6. When the range finder knob is moved CCW or towards its high end, in which direction is the stop arm moved?
7. As viewed from the right, when a selected selecting lever is moving CW, in which direction is its associated push lever moving?
8. When a push lever is moved toward the front of the machine, the associated code bar shift bar is moving _____.
9. When a push lever is moving toward the rear of the machine, as viewed from the right, what part is moving a transfer lever CCW?
10. What direction are the code bar shift bars moved when the push lever reset bail cam strikes the push lever reset bail?

POSITIONING OF THE CODE BARS

INTRODUCTION:

The objective of this information sheet is to teach positioning of the code bars using correct terminology.

REFERENCE:

NAVSHIPS 0967-059-9010, Volume 1, Section 573-115-100, Pages 18-19

INFORMATION:

Positioning the Code Bars

During the transmission of the 5th intelligence impulse the high side of the

CODE BAR CLUTCH TRIP CAM, which is the last cam on the

SELECTOR CAM CLUTCH ASSEMBLY, moves the

CODE BAR CLUTCH TRIP SHAFT LEVER, which is attached to, and rotates the

CODE BAR CLUTCH TRIP SHAFT, which moves the

CODE BAR CLUTCH TRIP LEVER away from the

CODE BAR CLUTCH SHOE LEVER, releasing the CODE BAR CLUTCH. The rotation of the

CODE BAR CLUTCH ECCENTRIC gives forward and rearward movement to the

CODE BAR CLUTCH ECCENTRIC FOLLOWER ARM, which extends motion to the

SHIFT LEVER DRIVE SHAFT EXTENSION which rotates the

SHIFT LEVER DRIVE SHAFT, which extends an up and down motion to the

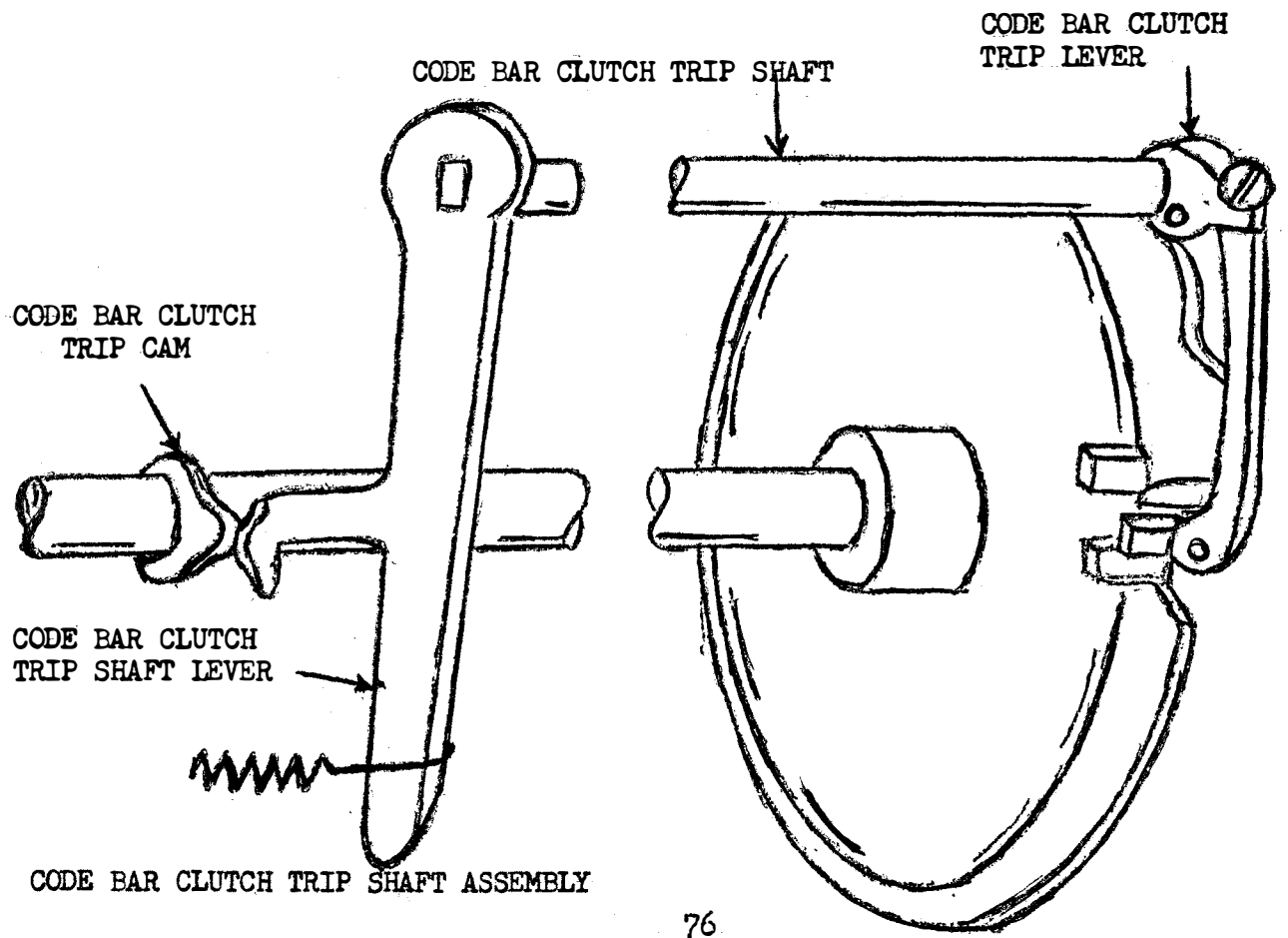
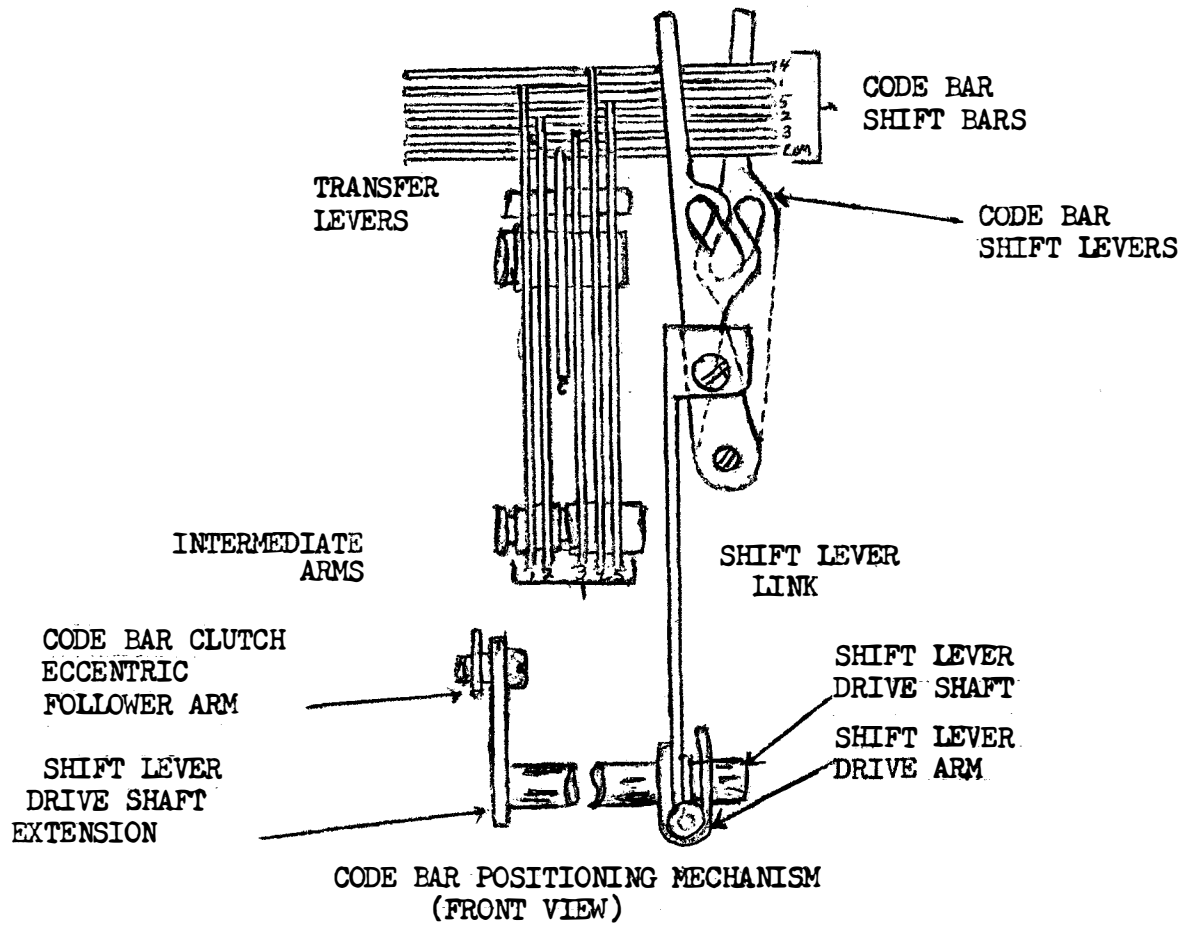
SHIFT LEVER LINK. As the SHIFT LEVER LINK moves up, the scissors action of the

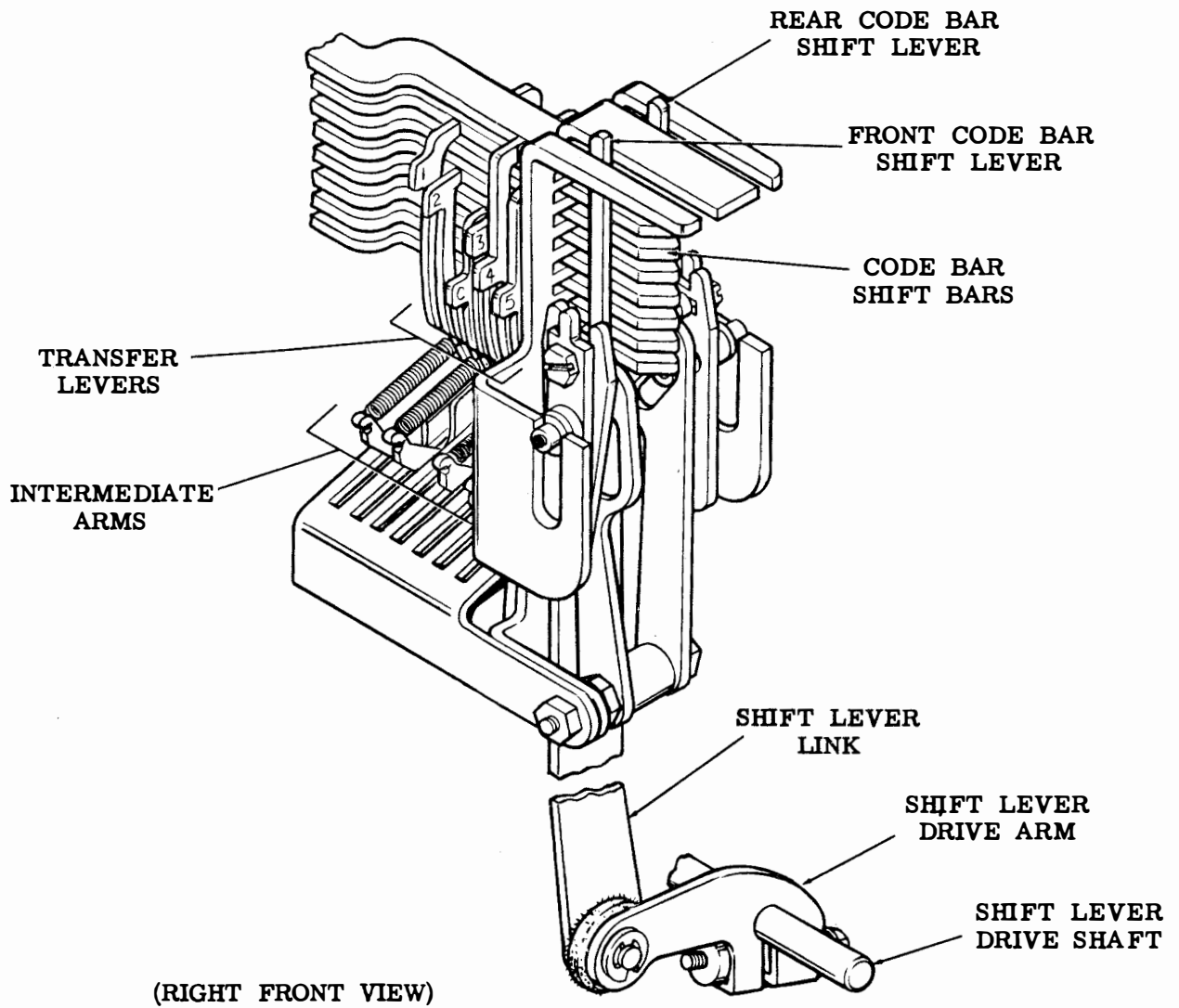
CODE BAR SHIFT LEVERS takes place through the medium of the slotted holes in the CODE BAR SHIFT LEVERS and the rollers attached to the SHIFT LEVER LINK moving up and down in the

SHIFT LEVER LINK GUIDE. The scissors action of the CODE BAR SHIFT LEVERS moves the

CODE BAR SHIFT BARS which in turn, move the

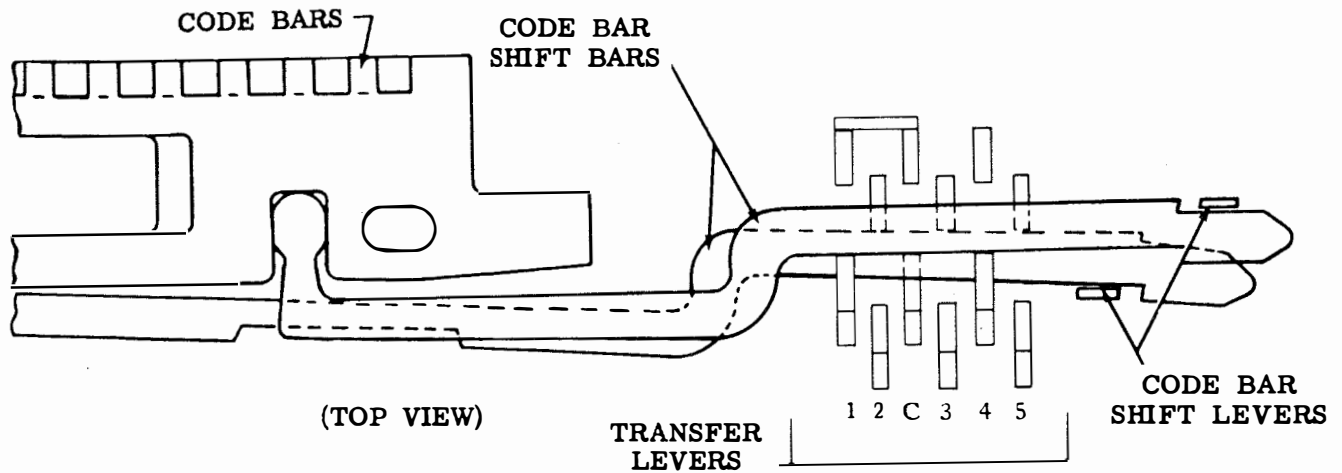
CODE BARS. On the upward movement of the SHIFT LEVER LINK, the front CODE BAR SHIFT LEVER moves the spacing CODE BAR SHIFT BARS to the right and the rear CODE BAR SHIFT LEVER moves the marking CODE BAR SHIFT BARS to the left.





(RIGHT FRONT VIEW)

Code Bar Mechanism



(TOP VIEW)

Code Bar Shift Bar Positioning

RELEASING THE FUNCTION AND TYPE BOX CLUTCHES

INTRODUCTION

The objective of this information sheet is to show the operation of releasing the function and type box clutches using correct terminology.

REFERENCE

Navships 0967-059-9010 Section 573-115-100 pages 22-23

INFORMATION

Releasing the Function and Type Box Clutches

When the

CODE BAR CLUTCH engages and starts to rotate, the

CODE BAR CLUTCH CAM, which is part of the

CODE BAR CLUTCH ASSEMBLY, also rotates. After completing approximately one half of its revolution, the

CODE BAR CLUTCH CAM FOLLOWER ARM ROLLER and the

CODE BAR CLUTCH CAM FOLLOWER ARM Move toward the low portion of the

CODE BAR CLUTCH CAM, powered by the

CODE BAR CLUTCH CAM FOLLOWER ARM SPRING and extending a rocker motion to the

CLUTCH TRIP LEVER SHAFT, which as it pivots, moves the

FUNCTION CLUTCH TRIP LEVER away from the

FUNCTION CLUTCH SHOE LEVER and permits it to engage and start to rotate.

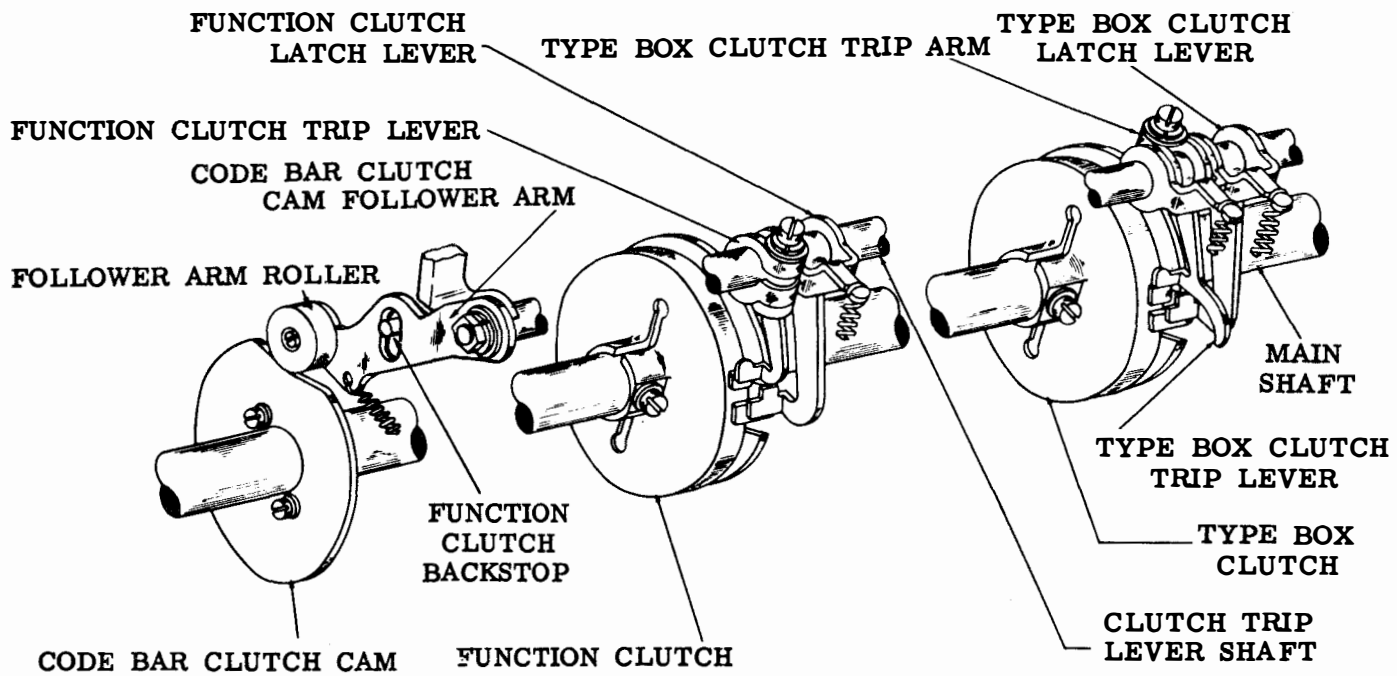
Also clamped to the CLUTCH TRIP LEVER SHAFT is the

TYPE BOX CLUTCH TRIP ARM which extends the pivot motion to the

TYPE BOX CLUTCH TRIP LEVER, moving it away from the

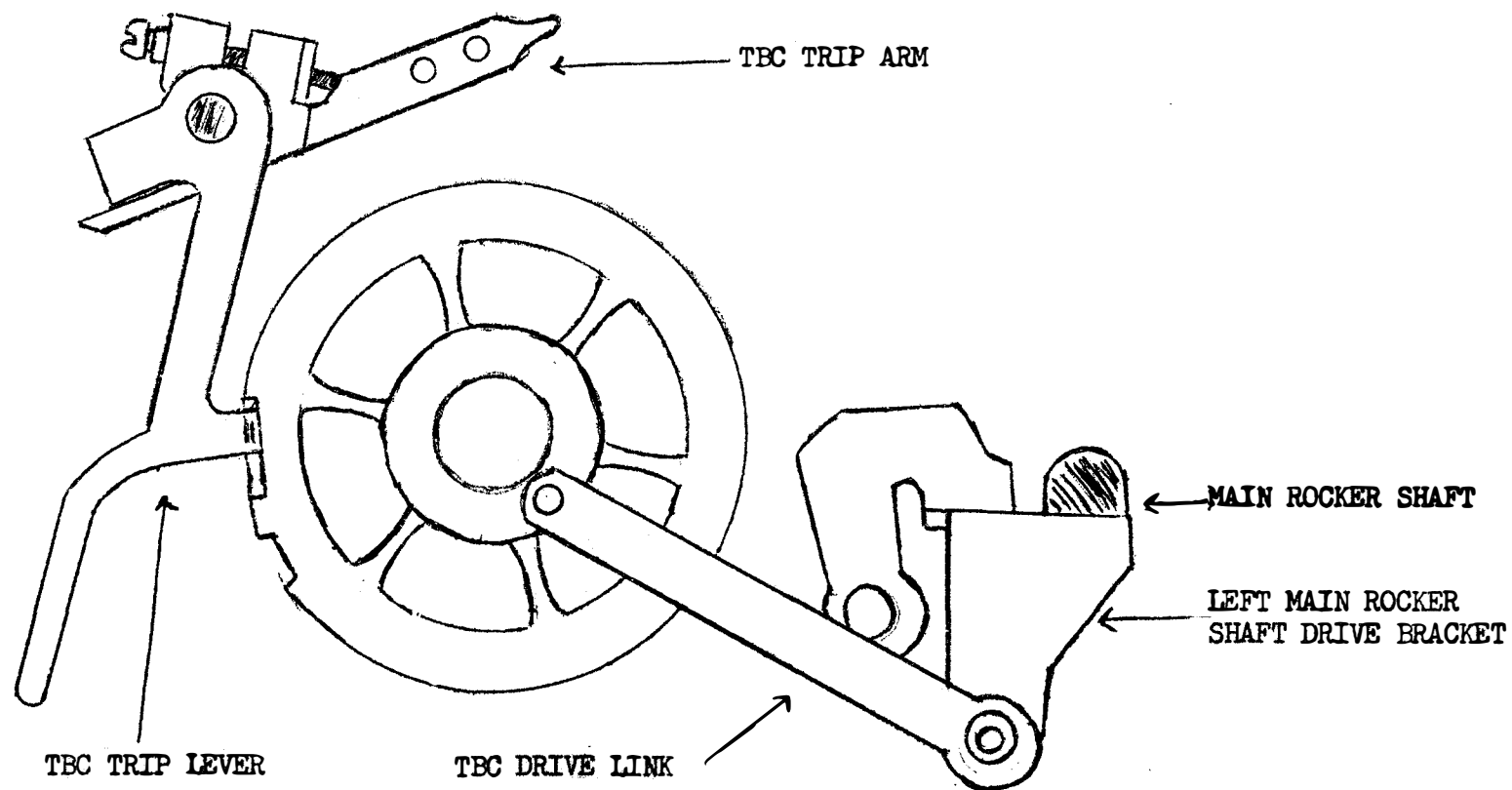
TYPE BOX CLUTCH SHOE LEVER and releasing it SHORTLY after the

FUNCTION CLUTCH.



Clutch Trip Mechanism

(RIGHT REAR VIEW)



TYPE BOX CLUTCH
(Left View)

VERTICAL POSITIONING

INTRODUCTION

The objective of this information sheet is to teach vertical positioning of the type box using correct terminology.

REFERENCE

Navships 0967-059-9010 Section 573-115-100 pages 22-23

INFORMATION

Vertical Positioning of the Type Box

The

COMMON TRANSFER LEVER is constructed with an extension on the rear which extends behind the #1 and #2

TRANSFER LEVERS so that at any time #1 and #2 TRANSFER LEVERS are marking, they will move the COMMON TRANSFER LEVER to a mark. Hence, only when both number one and number two TRANSFER LEVERS are spacing, will the COMMON TRANSFER LEVER be allowed to remain spacing.

VERTICAL POSITIONING is controlled by #1 and #2 intelligence pulses. The TYPE BOX CLUTCH has four (4) horizontal rows and each is associated with a CODE BAR.

HORIZONTAL ROWS OF TYPE BOX

TOP ROW - Controlled by the COMMON CODE BAR

SECOND ROW - Controlled by #2 CODE BAR

THIRD ROW - Controlled by #1 CODE BAR

BOTTOM ROW - Controlled by SUPPRESSION CODE BAR

The

TYPE BOX CARRIAGE TRACK is mounted between the

VERTICAL POSITIONING LEVERS.

As the TYPE BOX CLUTCH engages and begins to rotate, the TYPE BOX CLUTCH DRIVE LINK will rotate the MAIN ROCKER SHAFT DRIVE BRACKET (left side of typer) CW, rotating the MAIN ROCKER SHAFT CW, rotating the

ROCKER SHAFT BRACKET (right side of typer) CCW.

Both brackets will extend an up and down motion to the

MAIN SIDE LEVER DRIVE LINKS which extend a CW and CCW motion to the

MAIN SIDE LEVERS. The

VERTICAL POSITIONING LEVERS, attached to the front end of the

MAIN SIDE LEVERS, move up and down. On their upward movement they are stopped in the desired row by the #1, #2, COMMON or SUPPRESSION CODE BARS. (NOTE: The VERTICAL POSITIONING LEVERS WILL only strike a spacing code bar.)

Riding on the

TYPE BOX CARRIAGE TRACK is the

TYPE BOX CARRIAGE, which has the

TYPE BOX riding in it. At about the middle of the MAIN SIDE LEVERS,

projections ride over the toes of the

MAIN SIDE LEVER FOLLOWER ARMS. As the MAIN SIDE LEVERS go up and the toes rise, the

MAIN SIDE LEVER FOLLOWER ARM SPRINGS cause the MAIN SIDE LEVER FOLLOWER ARMS to rotate toward the front of the machine.

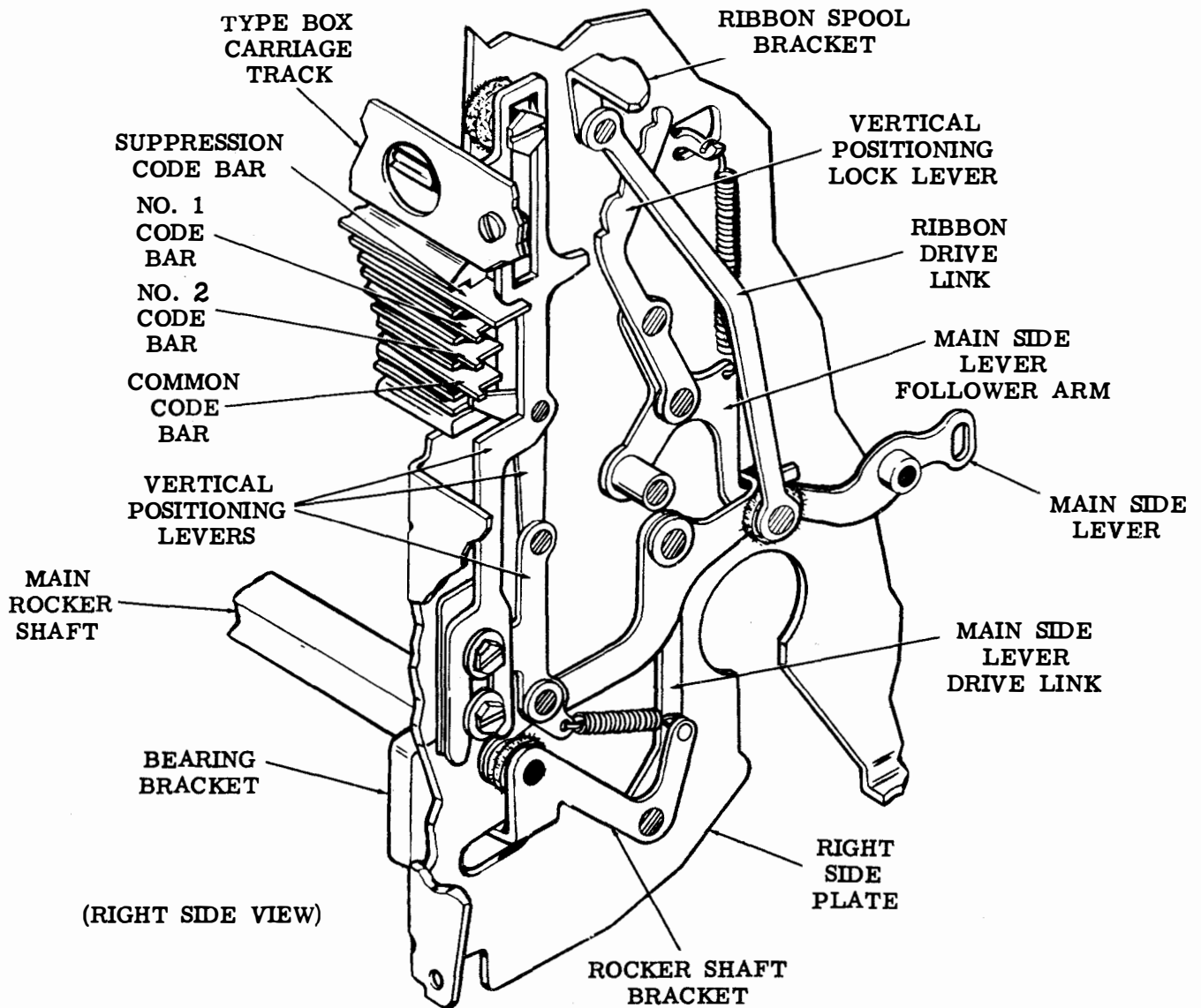
Attached to the MAIN SIDE LEVER FOLLOWER ARMS are the

VERTICAL POSITIONING LOCK LEVERS. The forward movement of the VERTICAL POSITIONING LOCK LEVERS will place one of the notches of the VERTICAL POSITIONING LOCK under a projection of the

VERTICAL POSITIONING LEVERS, momentarily locking them in their selected position.

LETTERS				LETTERS				FIGURES				FIGURES					
LEFT				RIGHT				LEFT				RIGHT					
4	8	5	MARKING	4	8	5	MARKING	4	8	5	MARKING	4	8	5	MARKING		
MARKING		SPACING		MARKING		SPACING		MARKING		SPACING		MARKING		SPACING			
TOP	M	N	H	SPACE	BLANK	T	C. R.	O	.	,	#	SPACE	BLANK	5	C. R.	9	
	--3	4	5	--3		---	5	---		--3	4	5		---	5	---	
2ND	X	F	Y	S	E	Z	D	B	/	!	6	BELL	3	"	\$?	
	1	--3	4	5		---	5	---		1	--3	4	5		---	5	---
3RD	V	C	P	I	L. F.	L	R	G	;	:	0	8	L. F.)	4	8	
	2	--3	4	5		---	5	---		2	--3	4	5		---	5	---
BOTTOM	LETTERS	K	Q	U	A	W	J	FIGURES	LETTERS	(1	7	-	2	∇	FIGURES	
	1	2	3	4		1	2	3		1	2	3		1	2	3	
	3 MARKING				3 SPACING				3 MARKING				3 SPACING				
4TH	3RD	2ND	1ST	1ST	2ND	3RD	4TH	4TH	3RD	2ND	1ST	1ST	2ND	3RD	4TH		
ROW	ROW	ROW	ROW	ROW	ROW	ROW	ROW	ROW	ROW	ROW	ROW	ROW	ROW	ROW	ROW		

Typical Type Box Pallet Arrangement



Right Side Plate Mechanisms

HORIZONTAL POSITIONING OF THE TYPE BOX

INTRODUCTION

The objective of this information sheet is to teach the horizontal positioning of the type box using correct terminology.

REFERENCE

Navships 0967-059-9010 ISS I, SECTION 573-115-100, pages 23-27

INFORMATION

In the TYPE BOX there are 16 vertical rows. We are concerned with either the LETTERS or FIGURES side of the TYPE BOX. Each side is divided into two halves. In our explanation we will use the LETTERS side. The operation is identical for either side.

There are eight (8) vertical rows on the LETTERS side in horizontal positioning which are reduced to four (4) rows on the left half and four (4) rows on the right half. The #3 CODE BAR determines whether the selection is to be made from the left four vertical rows or the right four vertical rows (in either the figures or letters field). The #4 and #5 CODE BARS determine the selection of one row from the four vertical rows predetermined by the #3 CODE BAR.

Initial Action

As the

#3 CODE BAR moves for a MARK or SPACE, its projection moves the

REVERSING SLIDE SHIFT LEVER CCW or CW. The

REVERSING SLIDE SHIFT LEVER WILL cause the

HORIZONTAL MOTION REVERSING SLIDE to move either right or left. It, in turn has two

REVERSING SLIDE BRACKETS. One will be positioned to force a buckle of either the right or left

OSCILLATING RAIL SHIFT SLIDE DRIVE LINK. The unbuckled OSCILLATING RAIL SHIFT SLIDE DRIVE LINK will straighten (powered by its SPRING) moving the

LINK which will move the

HORIZONTAL POSITIONING LOCK LEVER ARM in a direction opposite to that of the

HORIZONTAL MOTION REVERSING SLIDE.

FINAL POSITIONING OF THE TYPE BOX

Attached to the
MAIN ROCKER SHAFT is the
MAIN BAIL DRIVE BRACKET which, in turn moves the
MAIN BAIL LINKS. In their downward travel, they pull down on the
MAIN BAIL which exerts tension on the
HORIZONTAL POSITIONING LOCK LEVER SPRING, which in turn, pulls down on the
HORIZONTAL POSITIONING LOCK LEVER which goes down and locks the
HORIZONTAL POSITIONING LOCK LEVER ARM.

As the
MAIN BAIL moves down it pulls down on the
SHIFT SLIDE DRIVE LINKS, The one that was buckled will buckle completely.
The one that was straight will straighten completely, driving the
OSCILLATING RAIL SHIFT SLIDE and the
DECELERATING SLIDE until the DECELERATING SLIDE strikes one of the
HORIZONTAL MOTION STOP SLIDES.

Attached to the
OSCILLATING RAIL SHIFT SLIDE and moved by it are the
OSCILLATING RAIL SHIFT LINKS which are attached to and move the
OSCILLATING RAIL. At each end of the
OSCILLATING RAIL is a roller with a
DRAW WIRE ROPE which operates the
OSCILLATING RAIL SLIDE which operates the
TYPE BOX CARRIAGE LINK which extends motion to the
TYPE BOX CARRIAGE and
TYPE BOX

The
#4 HORIZONTAL MOTION STOP SLIDE (upper) is controlled by the
#4 CODE BAR in the following manner.

When the

#4 CODE BAR is MARKING, it rotates the associated
CODE BAR BELL CRANK CCW, as viewed from the top, which moves the
#4 HORIZONTAL MOTION STOP SLIDE out toward the front of the machine.

When the

#4 CODE BAR is SPACING, its
CODE BAR BELL CRANK is rotated CW, causing the
#4 HORIZONTAL MOTION STOP SLIDE SPRING to pull the
#4 HORIZONTAL MOTION STOP SLIDE in (or toward the rear of the machine.)

The

#5 HORIZONTAL MOTION STOP SLIDE (lower) is controlled by the
#5 CODE BAR and CODE BAR BELL CRANK in the same manner. The
COMMON HORIZONTAL MOTION STOP SLIDE is controlled by the

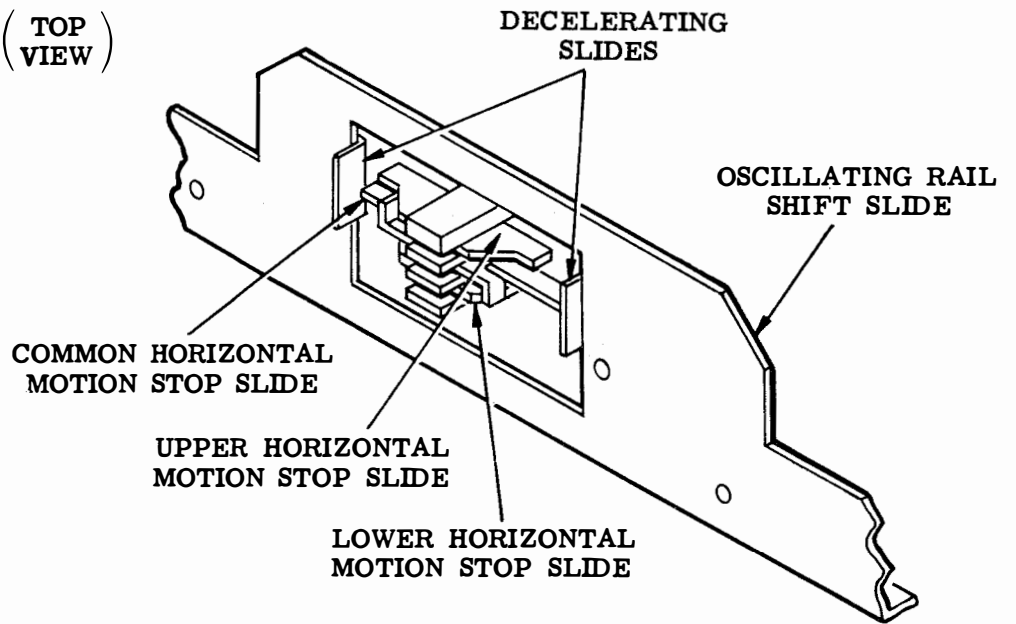
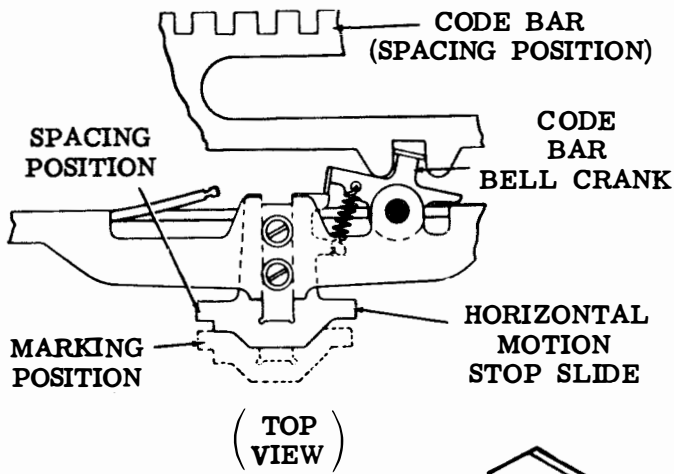
#4 and #5 HORIZONTAL MOTION STOP SLIDES in the following manner: The
COMMON HORIZONTAL MOTION STOP SLIDE HAS an extension up in front
of the #4 HORIZONTAL MOTION STOP SLIDE and down in front of the
#5 HORIZONTAL MOTION STOP SLIDE so that any time #4 or #5 HORIZONTAL
MOTION STOP SLIDES are out towards the front of the machine (marking)
they will bring the COMMON HORIZONTAL STOP SLIDE out also. Only when
#4 and #5 HORIZONTAL MOTION STOP SLIDES are spacing (toward the rear)
will the COMMON HORIZONTAL MOTION STOP SLIDE be permitted to remain
in or spacing. The COMMON HORIZONTAL MOTION STOP SLIDE has its own
spring which takes it to the rear.

The fourth stopping position is the SHANK OF COMMON. When both #4
and #5 HORIZONTAL MOTION STOP SLIDES are MARKING the COMMON HORIZONTAL
MOTION STOP SLIDE will also be towards the front, allowing the
DECELERATION SLIDE TO pass behind the #4, #5 and the COMMON HORIZONTAL
MOTION STOP SLIDES and come to rest against the SHANK OF COMMON.

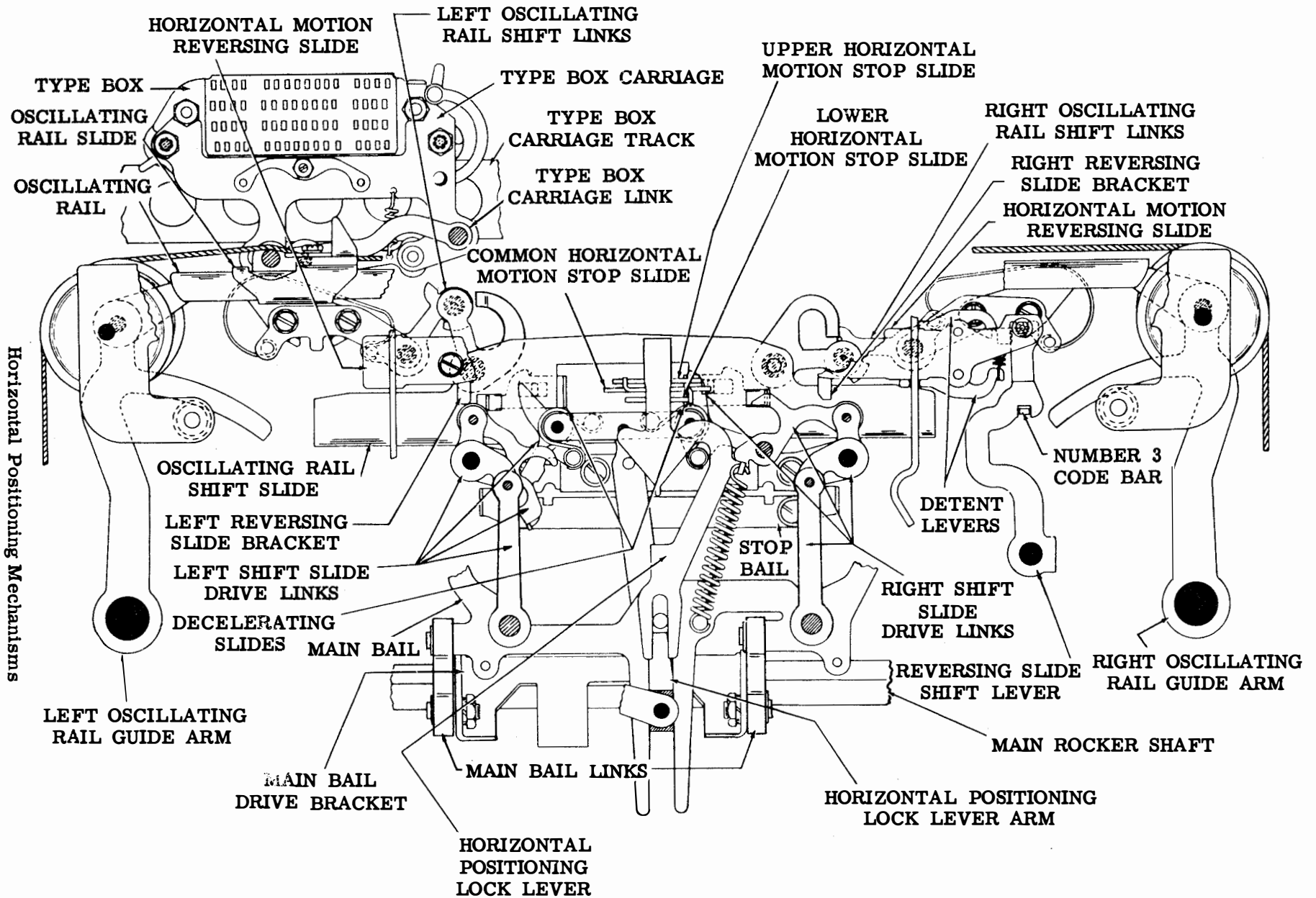
The four possible stopping positions of the DECELERATING SLIDES in
order are:

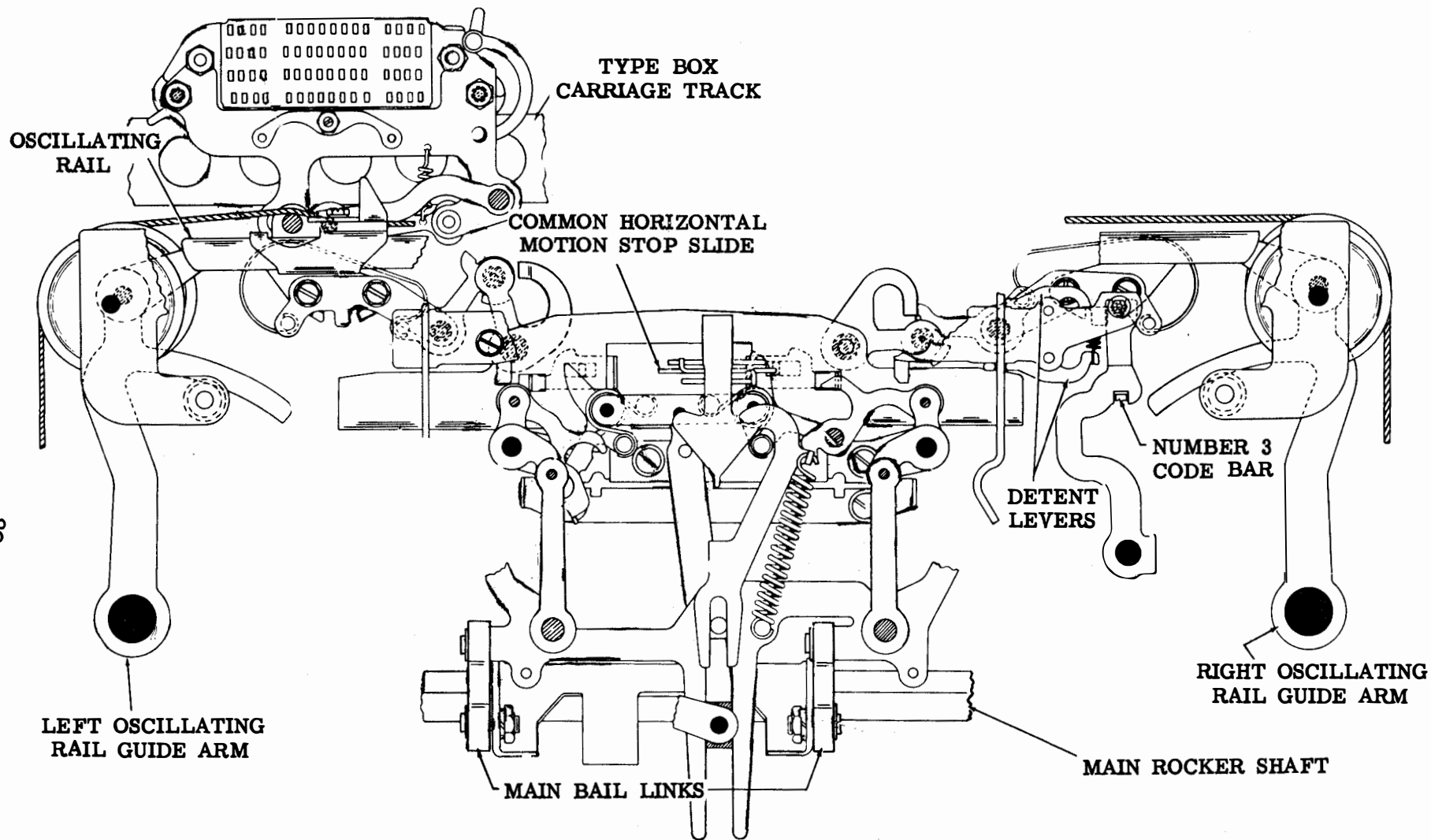
FIRST ROW -- COMMON HORIZONTAL MOTION STOP SLIDE
SECOND ROW - FOURTH HORIZONTAL MOTION STOP SLIDE
THIRD ROW - FIFTH HORIZONTAL MOTION STOP SLIDE
FOURTH ROW - SHANK OF COMMON

NOTE: The DECELERATING SLIDES will only strike a spacing HORIZONTAL
MOTION STOP SLIDE.

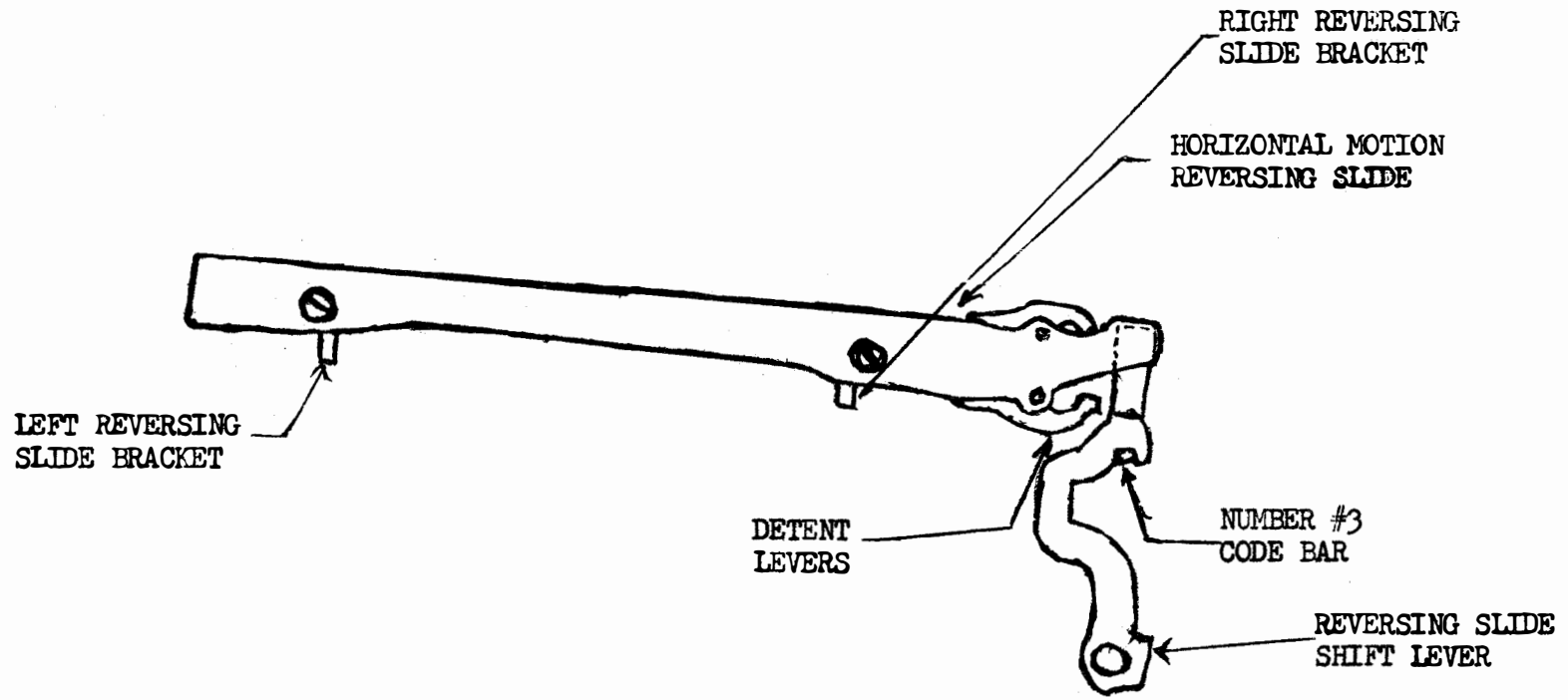


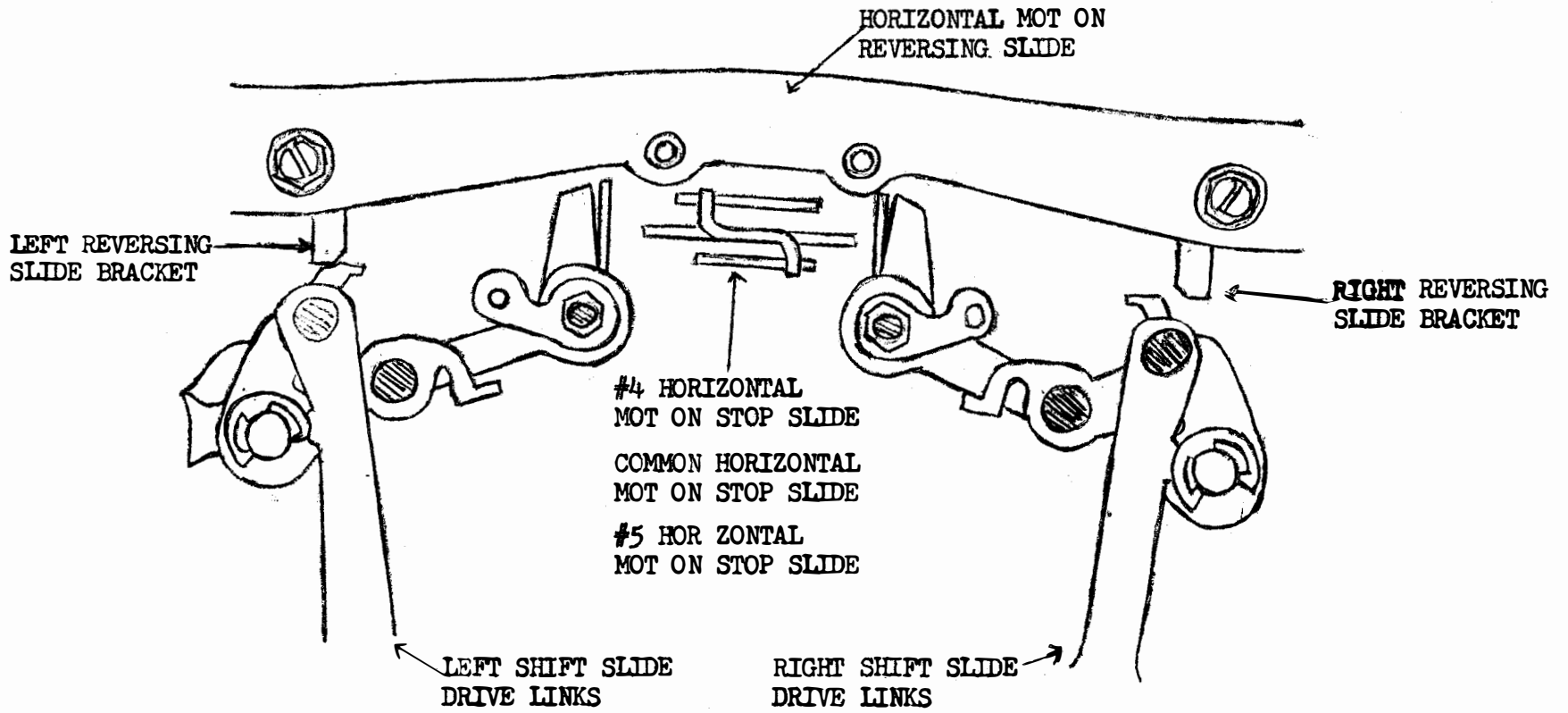
Horizontal Motion Stop Slides

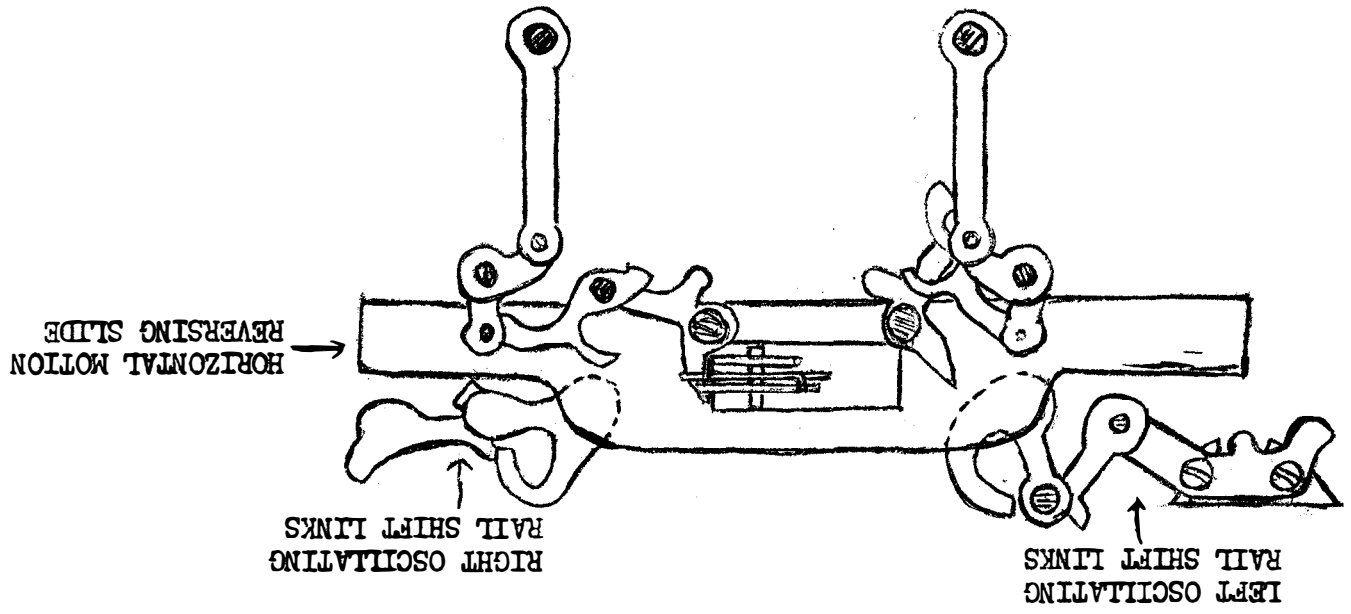


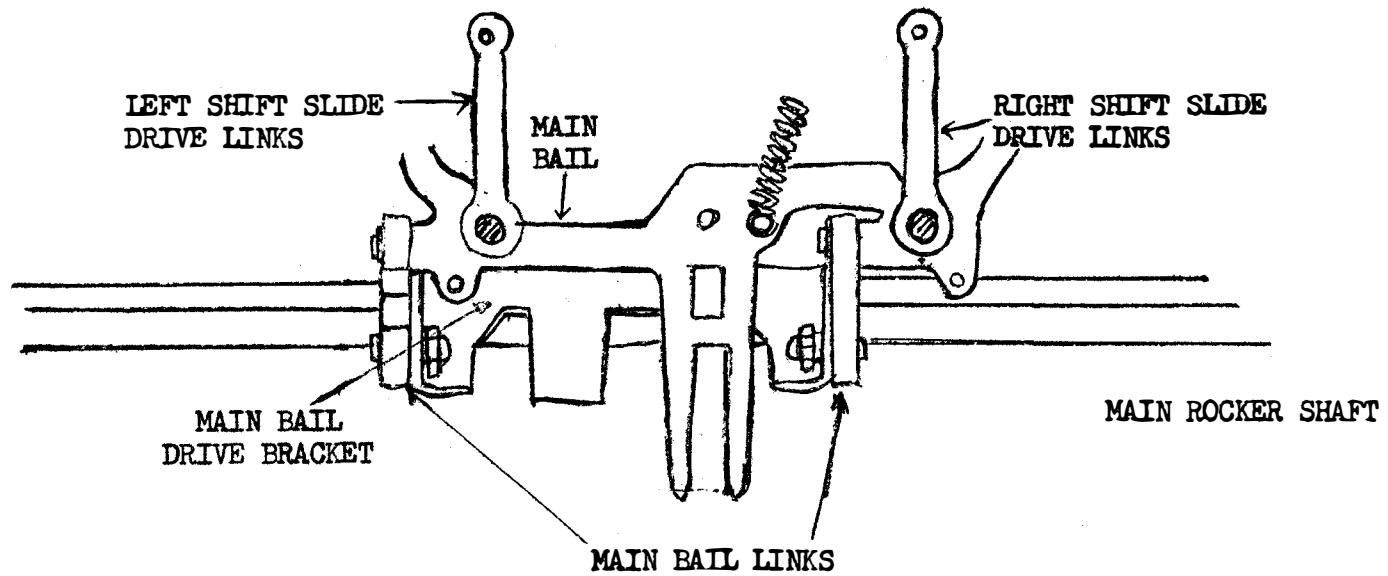


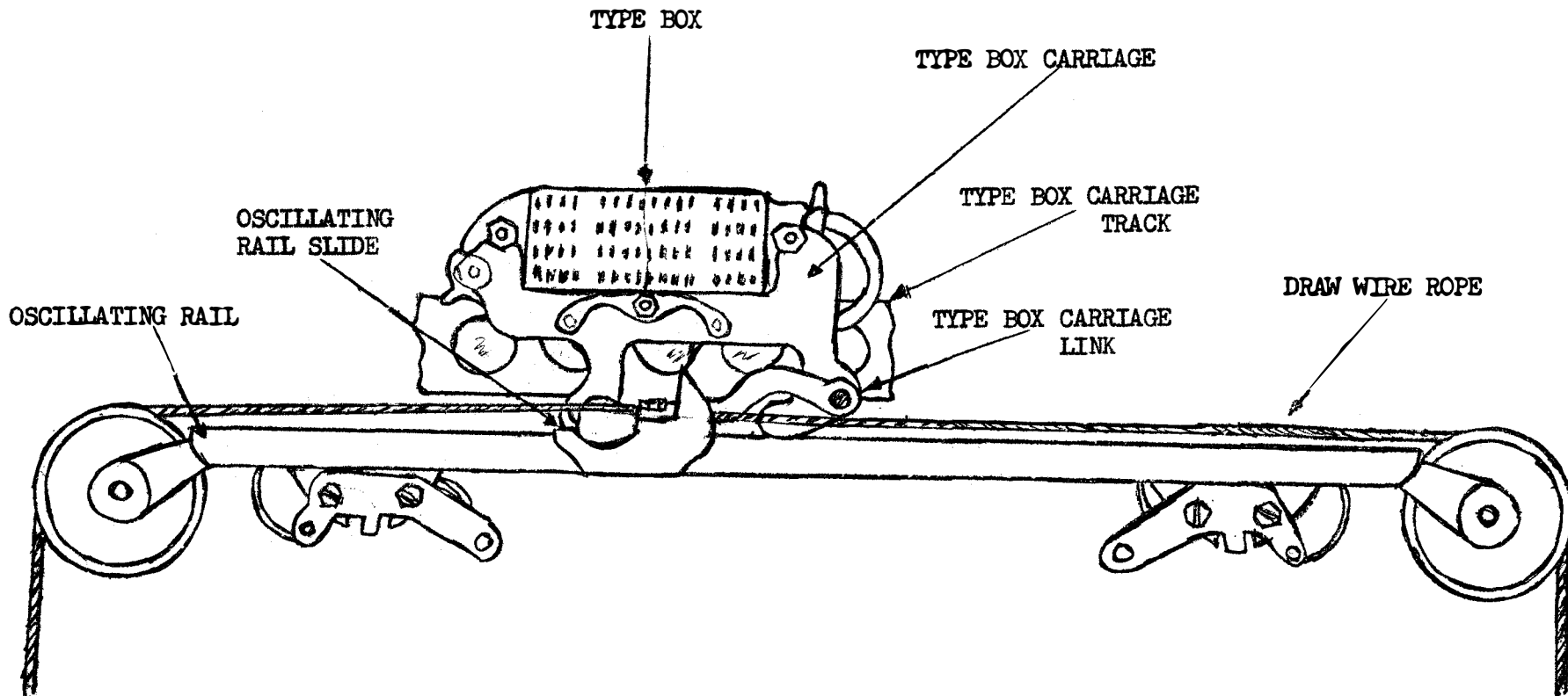
Horizontal Positioning Mechanisms











SELF-TEST ITEMS ON THE MODEL AN/UGC-20

INFORMATION

Answer the following questions and place your answers on the answer sheet provided. Refer to the technical manual and trainee's guide as necessary. Your work will be reviewed in the classroom by the instructor

REFERENCES

Navyships 0967-059-9010 Volume I. Technical Manual 28 compact keyboard Send-Receive (KSR) Teletypewriter Sets

QUESTIONS

1. The up and down movement of the type box is called _____.
2. The vertical positioning lock levers move all the way forward during what portion of the revolution of the type box clutch?
3. The power to buckle the vertical positioning levers is the TBC. What is the power to completely straighten them?
4. What is the initial movement of the shift slide drive links when #3 code bar is moved to the left?
5. What is the power to move the horizontal positioning lock lever up?
6. The power to move the common horizontal motion stop slide forward is derived from the code bar clutch eccentric. What is the power to move the common horizontal motion stop slide to the rear?
7. If the type box carriage link is moved to the right, what direction does the #3 code bar move?
8. Explain how the oscillation rail slide moves to the right when the oscillation rail guide arms are moving clockwise.
9. As viewed from the top, the code bar bell cranks are rotated clockwise under the power of _____.
10. Explain how the left decelerating slide is moved inboard while the main bail links are moving down.

PRINTING A CHARACTER AND RESETTING

INTRODUCTION

The objective of this information sheet is to teach the operation of printing a character and resetting using correct terminology.

REFERENCE

Navships 0967-059-9010 ISS I SECTION 573-11 5-100 page 27

INFORMATION

Printing

The rotation of the

TYPE BOX CLUTCH actuates the

TYPE BOX CLUTCH DRIVE LINK which is connected to and oscillates the

MAIN ROCKER SHAFT DRIVE BRACKET which is attached to and starts the oscillation of the

MAIN ROCKER SHAFT. In approximately the center of the main rocker shaft is connected the

MAIN BAIL DRIVE BRACKET which extends an up and down motion to the

MAIN BAIL LINKS and the

MAIN BAIL, which extends the same up and down motion to the

PRINTING TRACK. As the PRINTING TRACK moves down (initial movement) the

PRINTING ARM rotates CW, the top moving to the right striking the

PRINTING HAMMER OPERATING BAIL LATCH, moving it CCW (viewed from the top) and releasing the

PRINTING HAMMER OPERATING BAIL. The

PRINTING HAMMER OPERATING BAIL strikes the

PRINTING HAMMER OPERATING BAIL STOP. Momentum causes the

PRINTING HAMMER BAIL (mounted on the PRINTING HAMMER OPERATING BAIL) to continue toward the

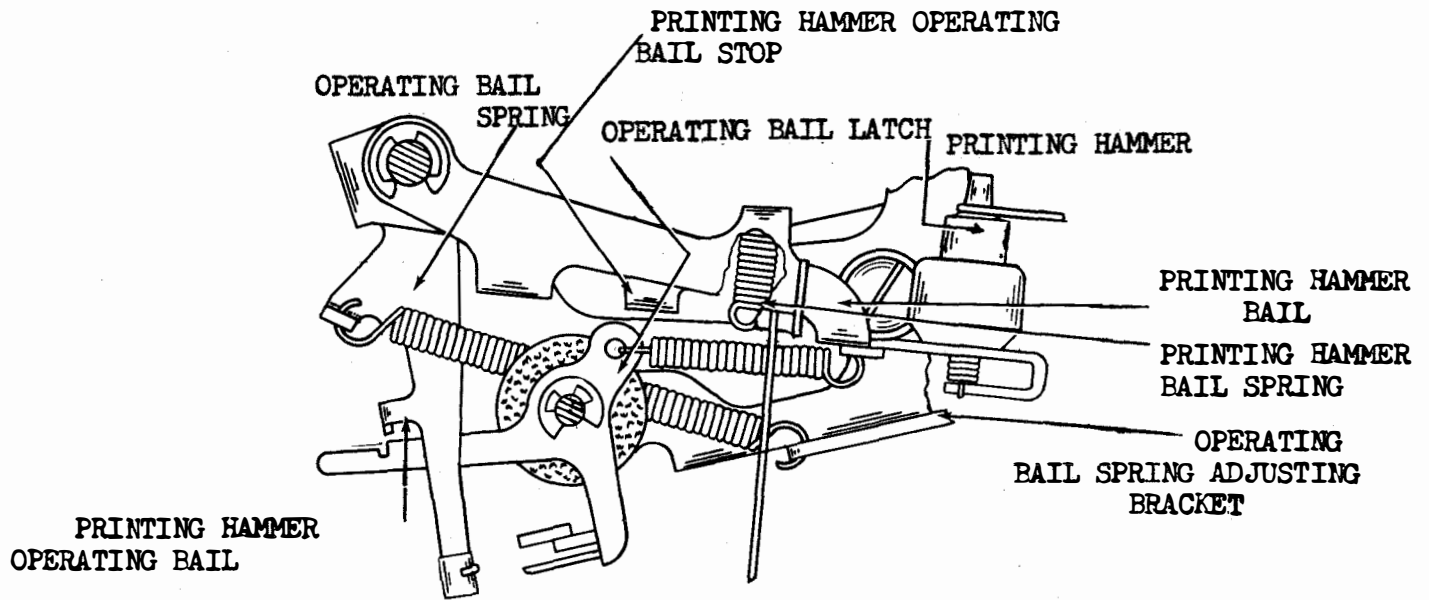
PLATEN against the tension of the

PRINTING HAMMER BAIL SPRING causing the
PRINTING HAMMER to strike the
TYPE PALLET, After the PRINTING HAMMER strikes the TYPE PALLET, the
PRINTING HAMMER BAIL SPRING contracts and pulls the
PRINTING HAMMER AWAY from the
TYPE PALLET.

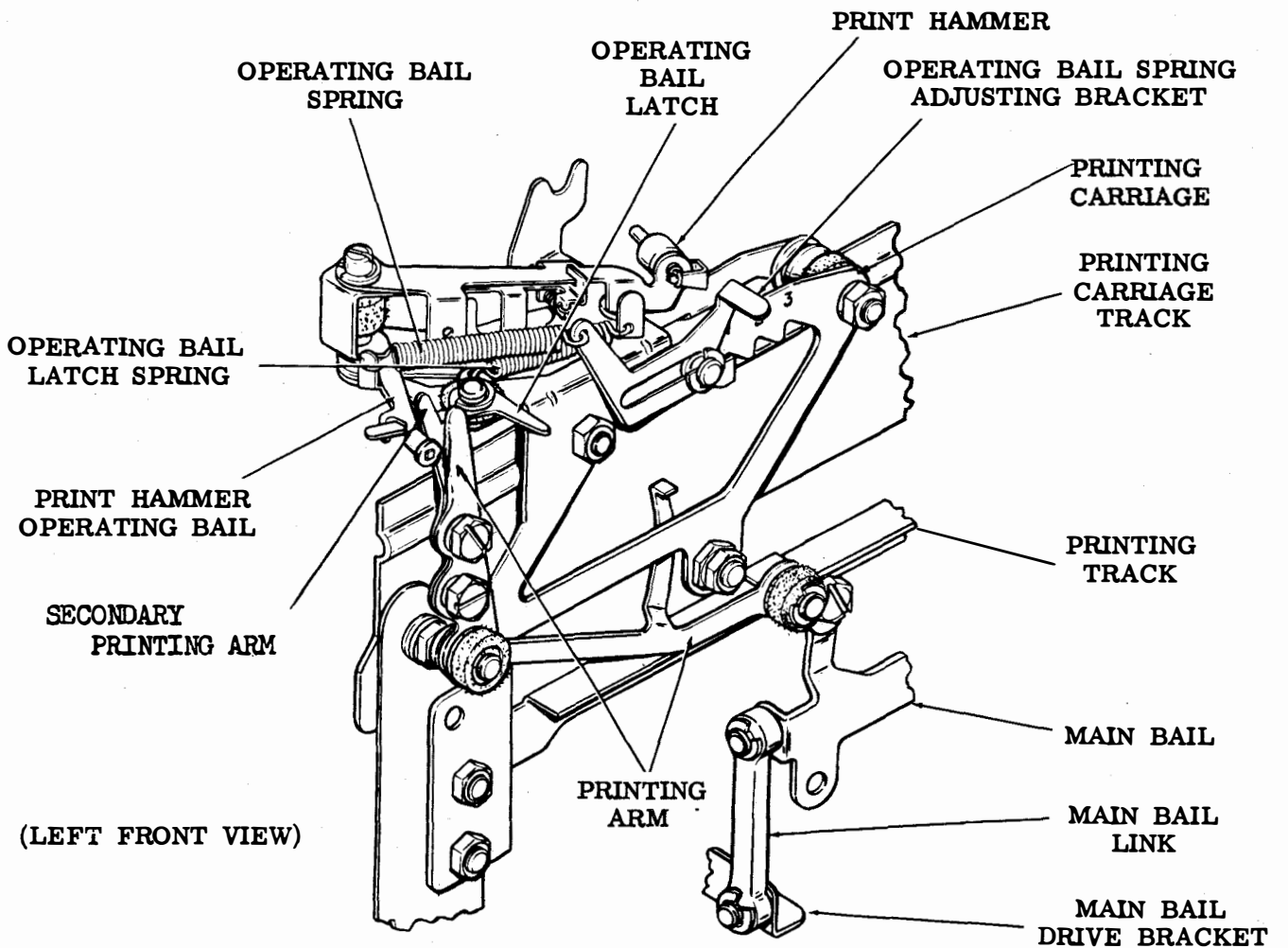
Resetting

To reset the PRINTING HAMMER, as the
MAIN BAIL moves up, moving the
PRINTING TRACK up which rotates the
PRINTING ARM in a CCW direction, which allows the
PRINTING HAMMER OPERATING BAIL LATCH to rotate CW. (viewed from the top), The
PRINTING ARM rotating CCW, top part going to the left, taking the
SECONDARY PRINTING ARM to the left moving the
PRINTING HAMMER OPERATING BAIL in a CW direction (viewed from the top)
which in turn pulls forward on the
PRINTING HAMMER BAIL through the medium of the
PRINTING HAMMER BAIL SPRING until the
PRINTING HAMMER OPERATING BAIL overtravels the notched portion of the
PRINTING HAMMER OPERATING BAIL LATCH. The
PRINTING HAMMER OPERATING BAIL is moved CW to its normal stop position
and held there by the
SECONDARY PRINTING ARM.

NOTE: The PRINTING HAMMER is held in a ball socket mounting by
a spring and is moveable. This is an aid in preventing
breakage.



PRINTING HAMMER MECHANISM (TOP VIEW)



(LEFT FRONT VIEW)

SELF-TEST ITEMS ON THE MODEL AN/UGC-20

DIRECTIONS

Answer the following questions and place your answers on this sheet. Refer to the Technical Manual and Trainee's Guide as necessary. Your work will be reviewed in the classroom by the instructor.

REFERENCES

Navships 0967-059-9010, Technical Manual Model 29 compact keyboard Send-Receive (KSR) Teletypewriter Sets

QUESTIONS

1. What is the power to take the top of the #4 Transfer Lever to the front?
2. What is the power to rotate the Push Lever Reset Bail CW as viewed from the right?
3. Why does the selector clutch make an almost complete revolution before the code bar clutch is engaged?
4. As the code bar clutch eccentric follower is moving to the rear, the shift lever link is moving _____.
5. Name the part(s) that is/are moved by the type box clutch trip arm in order to trip the type box clutch.
6. When the printing track is in its normal stop position, the printing hammer operating bail is being held by _____.
7. What is the initial movement of the main rocker shaft?
8. The code bars which move to the left for marking and right for spacing are positioned by the _____.
9. What is the power to position the code bars?
10. Why is the function clutch released shortly-before the TBC?

NORMAL SPACING

INTRODUCTION

The objective of this information sheet is to teach the operating procedure for normal spacing using correct terminology.

REFERENCE

Navships 0967-059-9010, ISS I, SECTION 573-115-100 pages 27-29

INFORMATION

Spacing will be accomplished with each printing and spacing operation in the following manner: As the

MAIN ROCKER SHAFT begins to oscillate, the

MAIN ROCKER SHAFT CAM PLATE contacts and moves the SPACING TRIP LEVER BAIL, which in turn moves the

SPACING TRIP LEVER. The notch on the upper part of the SPACING TRIP LEVER rides over the

SPACING CLUTCH TRIP ARM. Then as the MAIN ROCKER SHAFT returns to its normal stop position the MAIN ROCKER SHAFT CAM PLATE moves down allowing the SPACING TRIP LEVER BAIL to move down moving the SPACING TRIP LEVER down under the tension of the SPACING TRIP LEVER BAIL SPRING. As the SPACING TRIP LEVER MOVES down, it engages and moves the

SPACING CLUTCH TRIP ARM. This operates the

SPACING CLUTCH TRIP LEVER and releases the

SPACING CLUTCH, which allows the

SPACING SHAFT HELICAL DRIVING GEAR to rotate, thus rotating the

SPACING SHAFT HELICAL DRIVEN GEAR which will rotate the

SPACING SHAFT which operates the off-set

SPACING ECCENTRICS, which moves the

SPACING DRUM FEED PAWLS, which rotates the

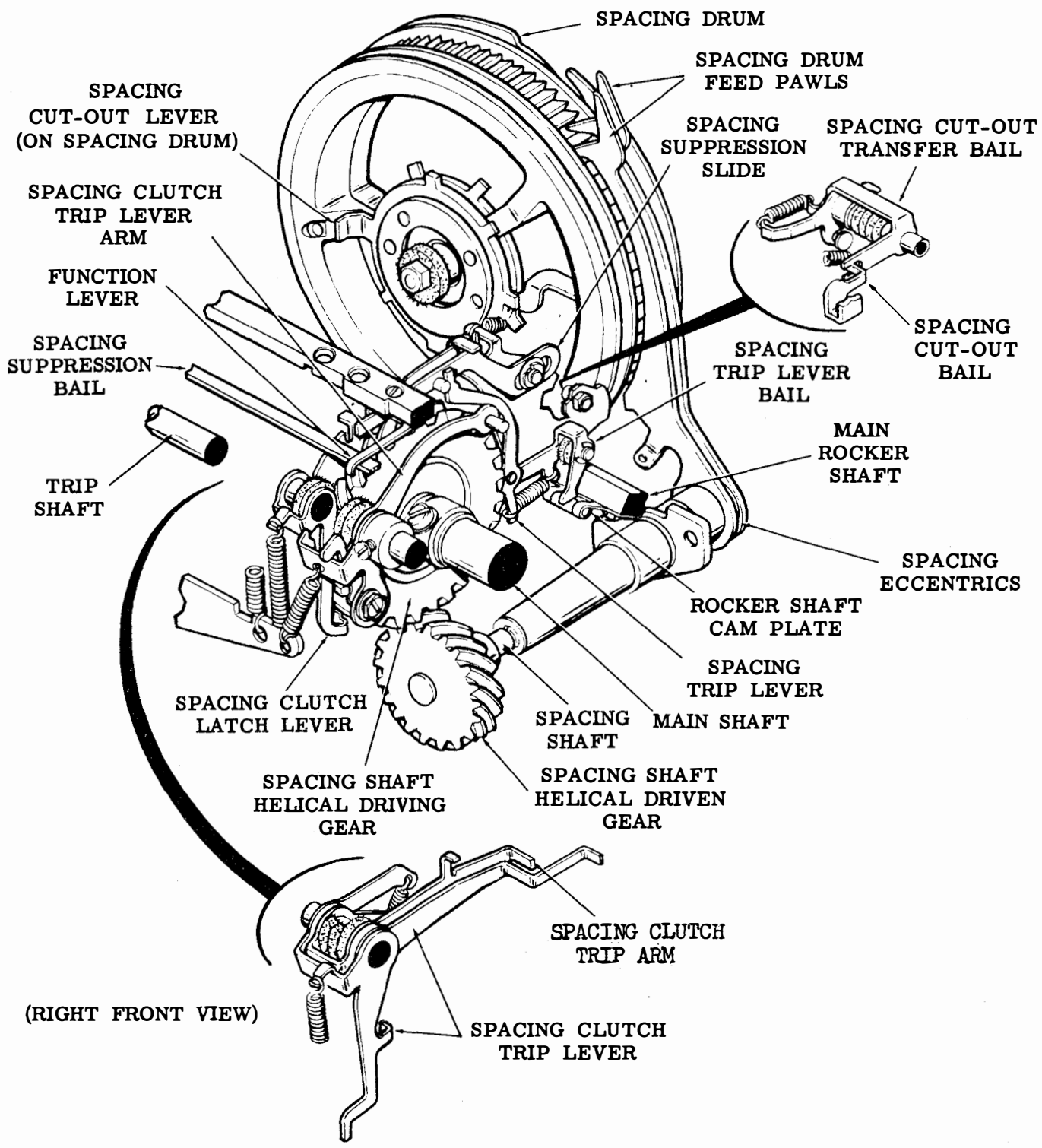
SPACING DRUM. Fastened to the SPACING DRUM is the

SPACING DRAW WIRE ROPE which, in turn effects spacing movement to the

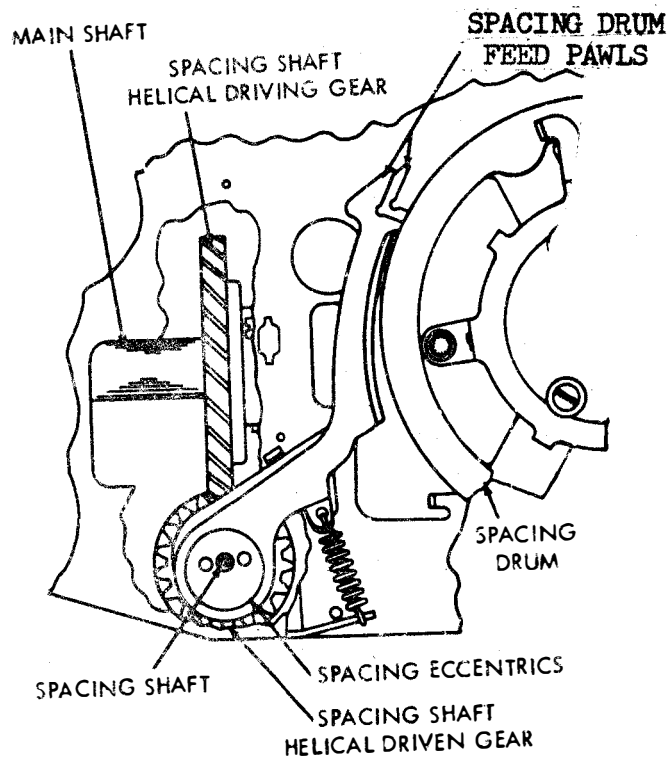
PRINTING CARRIAGE and OSCILLATING RAIL SLIDE.

Resetting

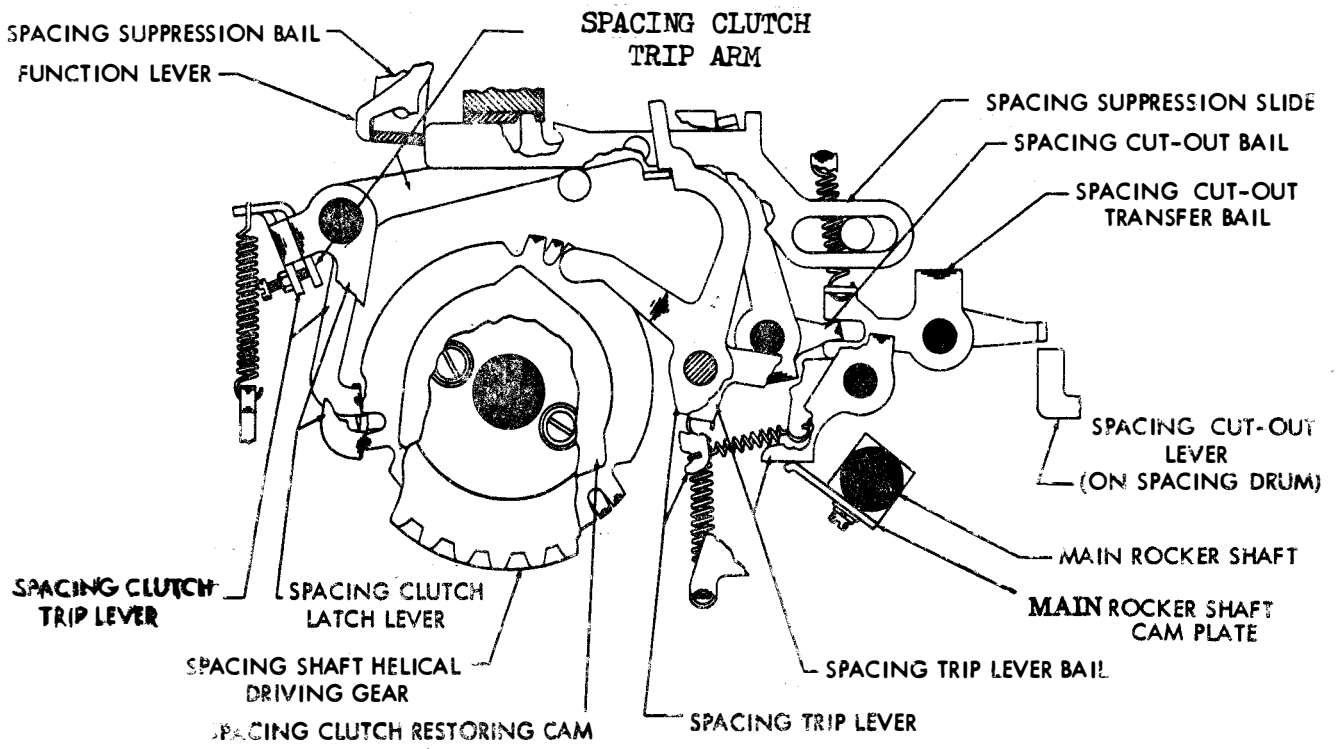
As the
SPACING CLUTCH is released, the
SPACING CLUTCH RESTORING CAM rotates and the arm of the
SPACING TRIP LEVER rides to one of the high portions of the
SPACING CLUTCH RESTORING CAM moving the
SPACING TRIP LEVER away from the
SPACING CLUTCH TRIP ARM, prior to 1/3 revolution of the SPACING CLUTCH,
allowing the
SPACING CLUTCH TRIP LEVER TO return to a position in the path of the
SPACING CLUTCH SHOE LEVER. The
SPACING CLUTCH RESTORING CAM has three (3) high portions corresponding
with the three (3) stops of the SPACING CLUTCH.



Spacing Mechanism



Spacing Drum Drive Mechanism



Spacing and Spacing Suppression Mechanisms

TYPICAL FUNCTIONS

INTRODUCTION

The objective of this information sheet is to teach the operating procedure of typical functions using correct terminology.

REFERENCE

Navships 0967-059-9010, Section 573-115-100 pages 32-36

INFORMATION

A typical function will be explained using the FUNCTION BAR, FUNCTION PAWL, and FUNCTION LEVER, which are common to all functions. All functions will be covered individually. The function box is constructed so that a total of 42 functions may be used. All functions are accomplished in the same basic way up through the operation of the FUNCTION LEVER. Some functions use the movement of the upper part of the FUNCTION LEVER and some use the bottom.

The

FUNCTION CLUTCH is a one stop clutch and makes one revolution per operation. Mounted on the

FUNCTION CLUTCH ASSEMBLY is the

FUNCTION CAM. As it starts to rotate, the

ROCKER SHAFT SPRING rotates the

ROCKER SHAFT, which drives the

FOLLOWER ARM that is connected to and moves the

FOLLOWER ARM ROLLER so that it rides on the low portion of the FUNCTION CAM during the first quarter revolution of the FUNCTION CLUTCH.

At the same time that the ROCKER SHAFT was rotated, the

FUNCTION BAR RESET BAIL SPRING caused the

FUNCTION BAR RESET BAIL to rotate around its pivots and move the

FUNCTION BAR RESET BAIL BLADE forward, permitting the

FUNCTION BAR SPRINGS to contract, pulling the

FUNCTION BARS forward, allowing them to enter the rear of the

CODE BARS. The

FUNCTION PAWL (powered by its own spring) then is pulled down over the rear end of the FUNCTION BAR. Near the end of the first one-half revolution of the

FUNCTION CLUTCH, the high portion of the

FUNCTION CAM moves the

FOLLOWER ARM ROLLER toward the front of the machine, moving the

RESET ARM which moves around its pivot (fixed) and the

FOLLOWER ARM ROLLER drives the

FOLLOWER ARM which is connected to and rotates the

ROCKER SHAFT which bears on the

FUNCTION BAR RESET BAIL ROLLER causing the

FUNCTION BAR RESET BAIL TO PIVOT, driving the

FUNCTION BAR RESET BAIL BLADE towards the rear, pushing the FUNCTION BAR to the rear. Since the FUNCTION PAWL is hooked over the top rear portion of the FUNCTION BAR, it will also go to the rear. As the

FUNCTION PAWL goes to the rear, its projection will take the

FUNCTION LEVER (top portion) to the rear and the bottom portion forward. This operation was completed on the first half revolution of the

FUNCTION CAM.

STRIPPING OF FUNCTIONS

INTRODUCTION

The objective of this information sheet is to teach the operating procedure for stripping of functions using correct terminology.

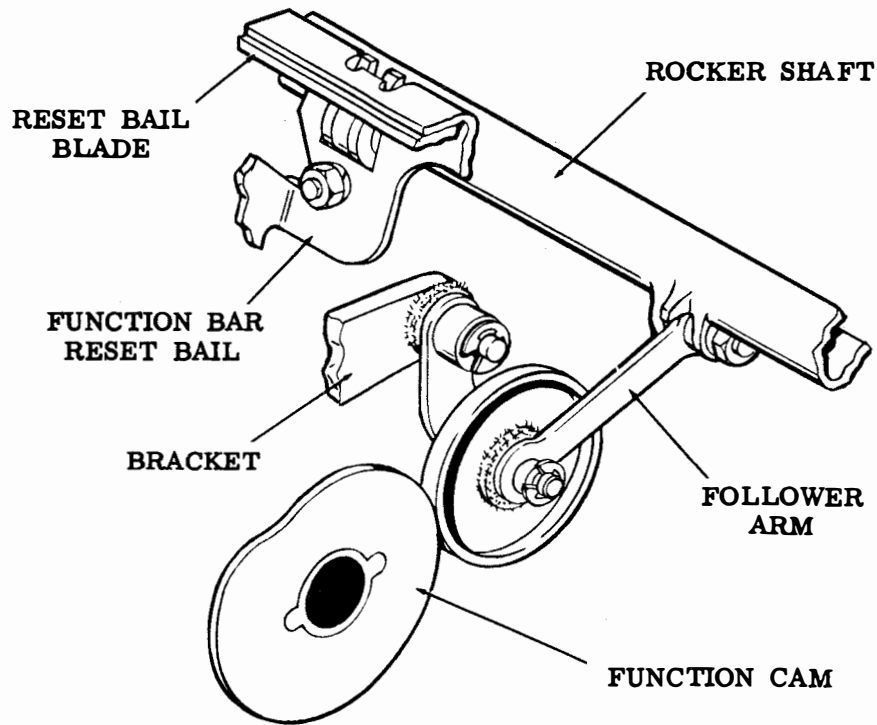
REFERENCE

Navships 0967-059-9010, Section 573-115-100 page 36

INFORMATION

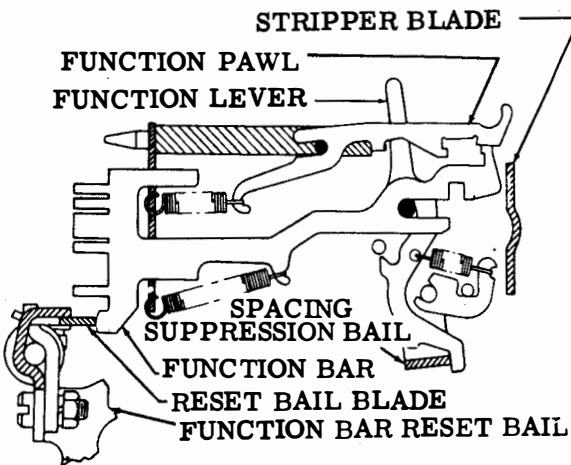
Mounted on the
FUNCTION CLUTCH ASSEMBLY is the
FUNCTION CLUTCH ECCENTRIC which is encompassed by the
ECCENTRIC FOLLOWER that is bolted to, and extends an up and down motion
to the
DRIVING LINK, which causes a clockwise and counterclockwise movement to the
DRIVING ARM which rotates the
CAM ARMS which extend an up and down motion to the
STRIPPER BLADE.

The ECCENTRIC makes 1 revolution per operation and the STRIPPER BLADE first moves down, then all the way back up to its normal stop position. At this time the FUNCTION CLUTCH is disengaged and stops. When the STRIPPER BLADE moves up, it will strip the selected FUNCTION PAWL(s) from the FUNCTION BARS. The FUNCTION PAWL(s) will be taken to the front (unoperated position) by its spring, allowing the FUNCTION LEVER SPRINGS to pull the FUNCTION LEVERS, top to the front and bottom to the rear, to its normal stop position.

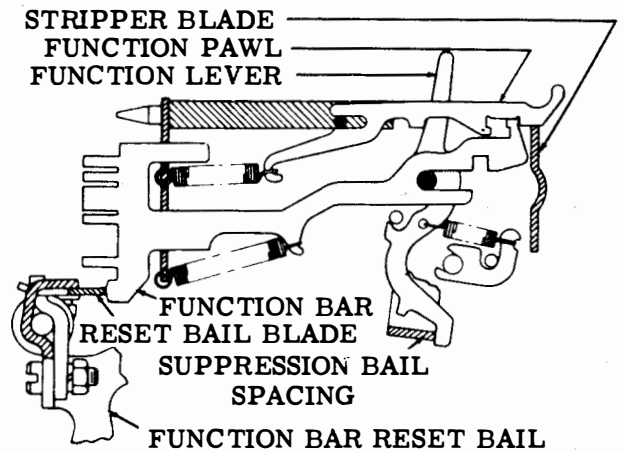


(LEFT REAR VIEW)

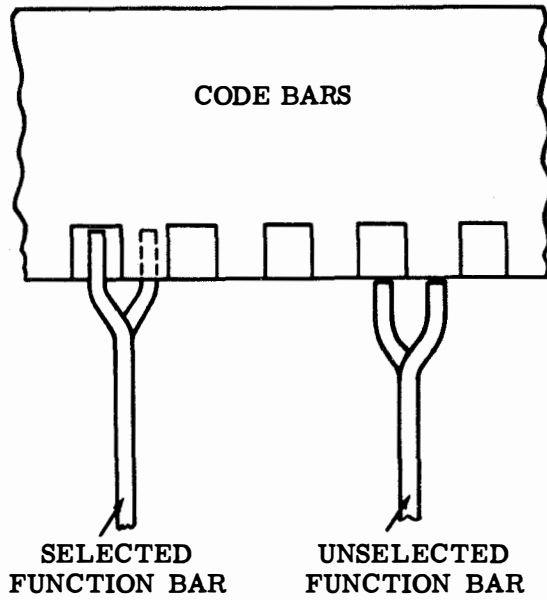
Reset Bail Mechanism



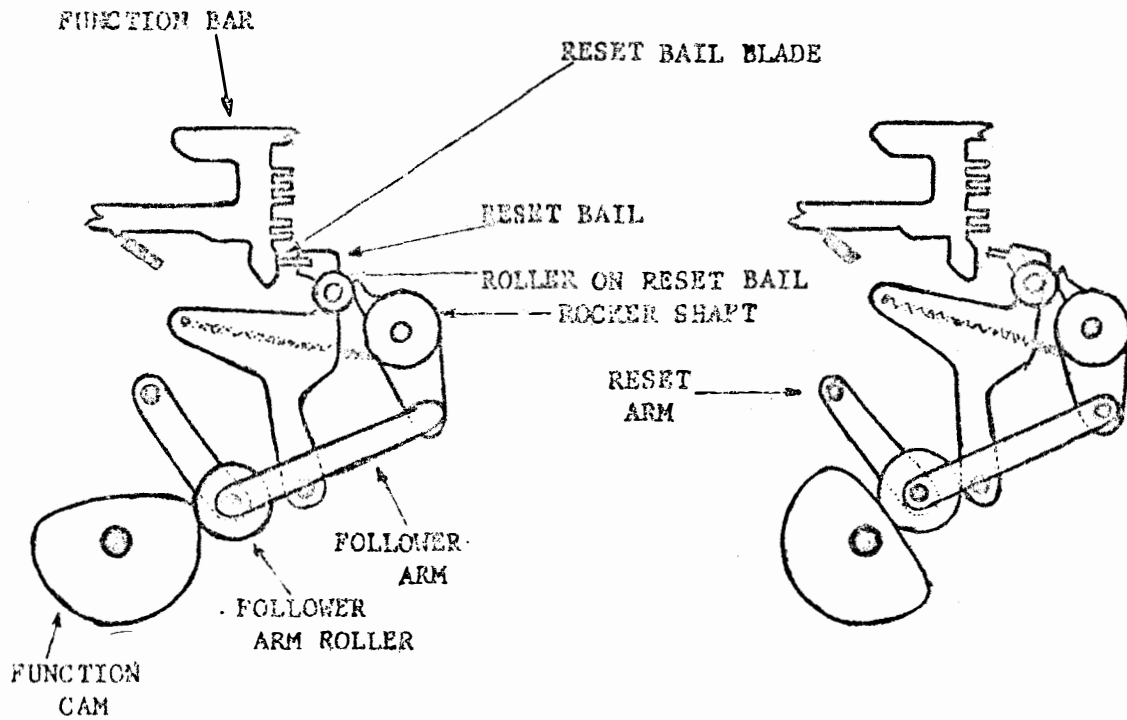
Typical Function Linkage (Unselected)



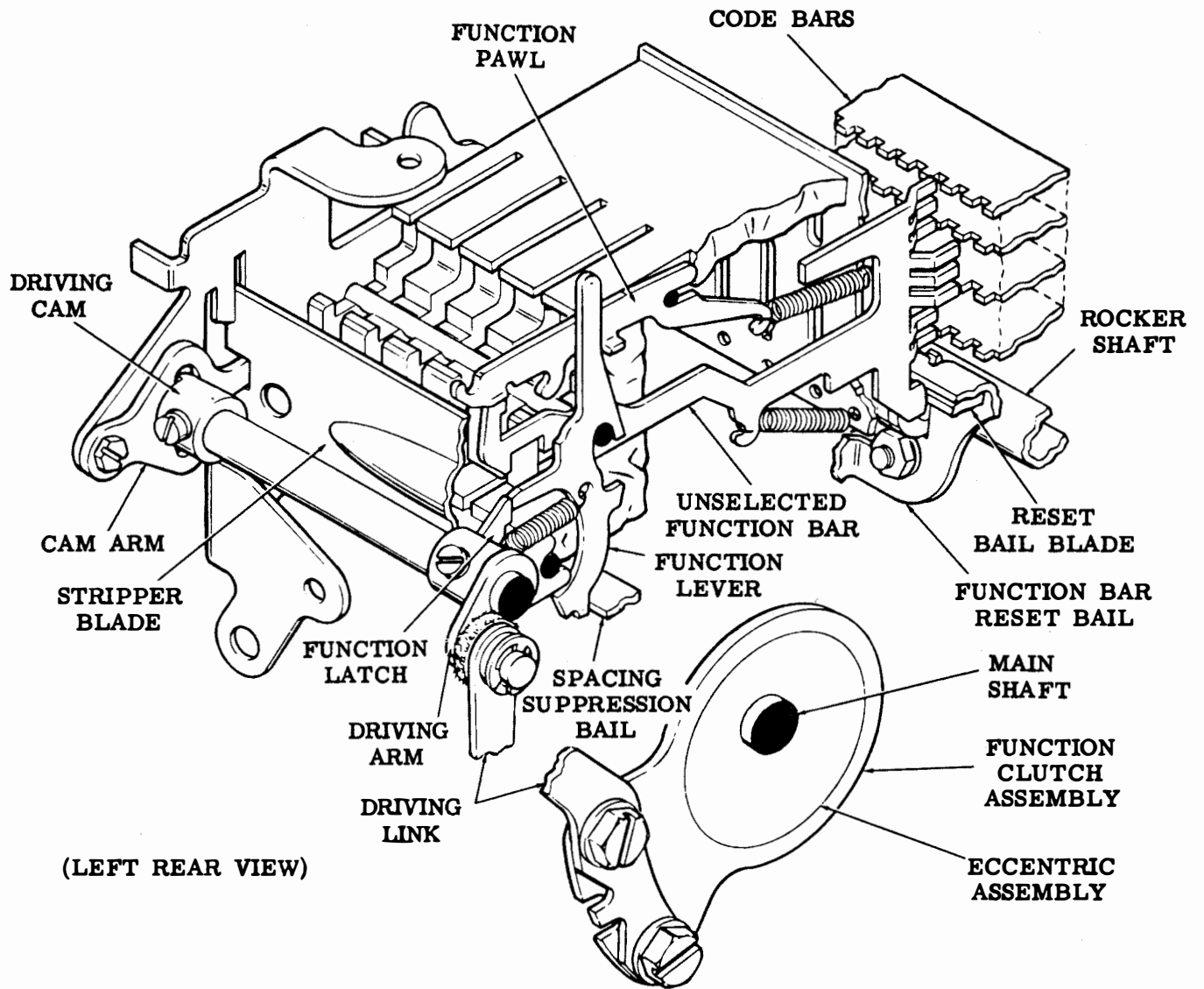
Typical Function Linkage (Selected)



Function Bar Selection



FUNCTION RESET MECHANISM (left side view)



Stunt Box (Function Linkage Unselected)

SELF-TEST ITEMS ON THE MODEL AN/UGC-20

INFORMATION

Answer the following questions and place your answers on this sheet. Refer to the technical manual and trainee's guide as necessary. Your work will be reviewed in the classroom by the instructor.

REFERENCES

Navships 0967-059-9010, Technical Manual 29 compact Keyboard Send-Receive (KSR) Teletypewriter Sets

QUESTIONS

1. In which direction will the rocker shaft cam plate (mounted on the main rocker shaft) move the spacing trip lever bail during the initial movement of the main rocker shaft?
2. What moves the spacing trip lever CW (left view)?
3. In which direction and how far will the printing carriage move when the spacing clutch makes one-third of a revolution?
4. List four (4) powers to move the spacing trip lever.
5. State the reason for ribbon oscillation
6. What moves the ribbon levers inboard?
7. Ribbon feed is accomplished on _____ movement of the main bail.
8. What moves and holds the function bars to their normal stop position?
9. What is the initial movement of the function bar reset bail and the power for this movement?
10. What is the power that moves a function lever to its operated position?

SPACING SUPPRESSION AND SIGNAL BELL FUNCTIONS

INTRODUCTION

The objective of this information sheet is to teach the operating procedure of the spacing suppression mechanism and the signal bell function using correct terminology.

REFERENCE

Navships 0967-059-9010, ISS I, Section 573-115-100 pages 29, 41-42

INFORMATION

Spacing Suppression

Spacing suppression occurs on functions which do not require spacing, and is accomplished by the movement of the Bottom of the

FUNCTION LEVERS moving the

SPACING SUPPRESSION BAIL forward, which strikes the

SPACING SUPPRESSION SLIDE which has a projection that strikes the

SPACING TRIP LEVER moving it out of the way of the

SPACING CLUTCH TRIP ARM. Now when the SPACING TRIP LEVER COMES down it will not come into contact with the SPACING CLUTCH TRIP ARM and the spacing clutch will not be allowed to engage.

Resetting

When the bottom of the

FUNCTION LEVER moves to the rear, it allows the

SPACING SUPPRESSION BAIL SPRINGS to return the

SPACING SUPPRESSION BAIL to the rear which frees the

SPACING SUPPRESSION SLIDE which is moved to the rear by the

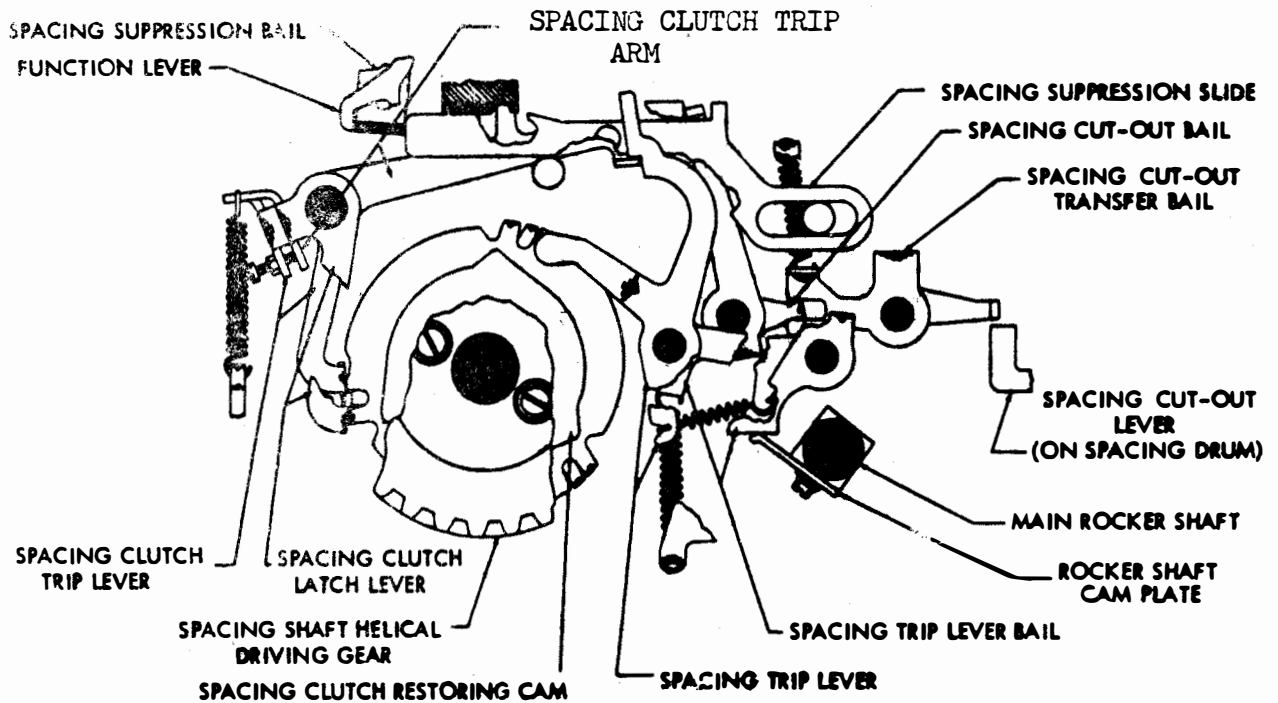
SPACING TRIP LEVER.

Signal Bell Function

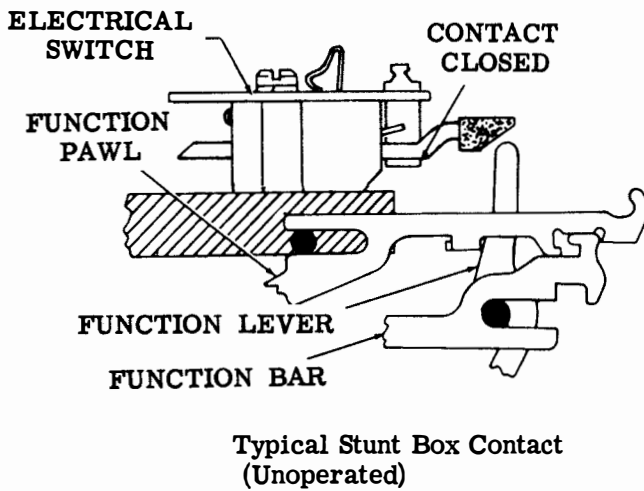
The SIGNAL BELL is located on the AUTOMATIC TYPER. The circuit to the SIGNAL BELL is controlled by a switch assembly located on the top of the FUNCTION BOX.

The
SIGNAL BELL FUNCTION BAR has an additional tine that corresponds to the
LETTERS-FIGURES SHIFT CODE BAR (S CODE BAR). When the machine is in
the LETTERS position the SIGNAL BELL FUNCTION BAR is blocked by the
"S" CODE BAR. However, when the machine is in the FIGURES position
and SIGNAL BELL (upper case "S") is selected, the top of the
FUNCTION LEVER goes to the rear, it will permit the
CONTACT ARM to move down under the tension of the
SPRING CONTACT completing the circuit, allowing a pulse of AC current
to go to the
SIGNAL BELL MAGNETS and causing the
SIGNAL BELL to ring.

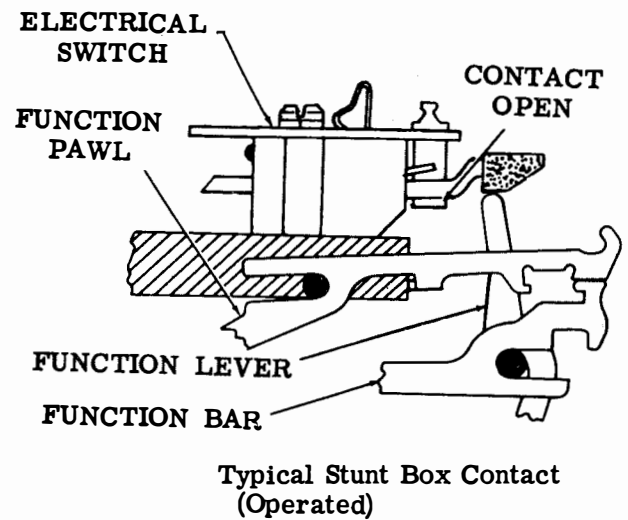
Remember, the FUNCTION LEVER is reset as soon as STRIPPING takes
place, and the normal stop position for a FUNCTION LEVER is with
the top to the front and the bottom to the rear.



SPACING AND SPACING SUPPRESSION MECHANISMS



Typical Stunt Box Contact (Unoperated)



Typical Stunt Box Contact (Operated)

OPERATION OF THE RIBBON MECHANISM

INTRODUCTION

The objective of this information sheet is to teach the operation of ribbon oscillation, ribbon feeding and ribbon reverse using correct terminology.

REFERENCE

Navships 0967-059-9010 Section 573-11.5-100 pages 30-31

INFORMATION

Ribbon Oscillation

The

MAIN SIDE LEVERS move the

RIBBON DRIVE LINKS which move the

RIBBON SPOOL BRACKETS which move the

RIBBON SPOOLS. They bring the

RIBBON up for printing and down for reading

Ribbon Feeding

As the

RIBBON DRIVE LINK moves the

RIBBON SPOOL BRACKET up, the

RATCHET FEED LEVER skips over one tooth, while the

RATCHET DETENT LEVER holds the

RIBBON RATCHET WHEEL from turning backward, When the RIBBON SPOOL BRACKET is moved down, the RATCHET FEED LEVER engages a

RATCHET TOOTH, and pushes the

RIBBON RATCHET WHEEL. A tooth on the

RIBBON RATCHET WHEEL then skips over the RATCHET DETENT LEVER. The RIBBON TENSION PLATE also turns. When its lug makes contact with the

RIBBON TENSION BRACKET, it will also rotate and will rotate the

RIBBON SPOOL SHAFT which will wind the ribbon.

Ribbon Reverse

Assume the ribbon is feeding from left to right. As it nears the end of the ribbon, the

RIBBON EYELET engages the

RIBBON LEVER and pulls it to the right, as the

RIBBON SPOOL BRACKET is moved upward, the RIBBON LEVER will engage the

RIBBON REVERSING LEVER, moving it upward and with it the

RIBBON FEED REVERSE LEVER which will allow the left set of

RATCHET FEED AND DETENT LEVERS to move up to engage the

RATCHET WHEEL. At the same time that the RIBBON REVERSING LEVER starts to move up, its teeth will engage teeth of the

RIBBON REVERSE SPUR GEAR which will rotate the

RIBBON REVERSE SHAFT which drives the

RIGHT RIBBON REVERSE SPUR GEAR which drive the

RIGHT RIBBON REVERSE LEVER causing the

RIGHT RIBBON FEED REVERSE LEVER to move downward so that it holds the right set of

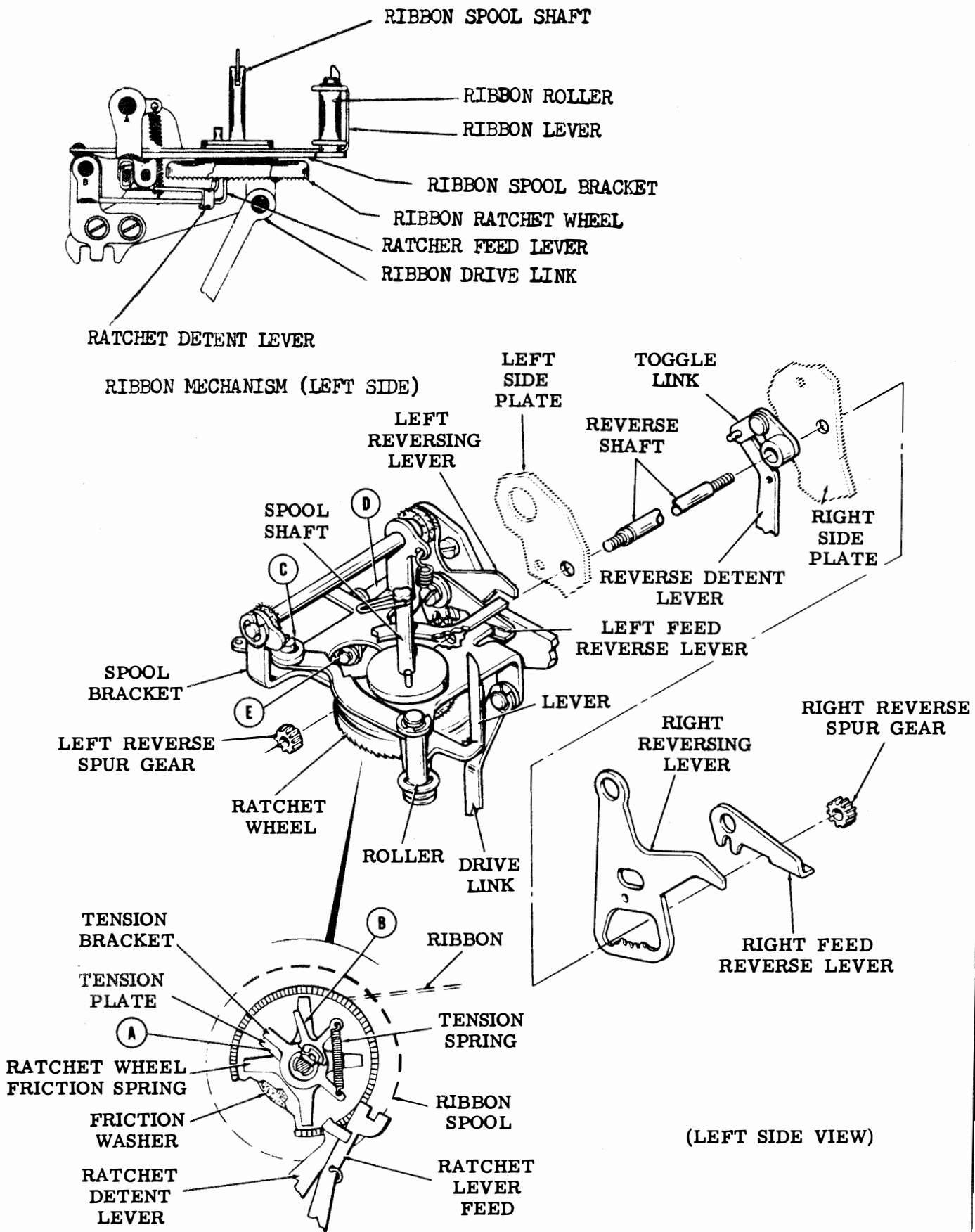
RATCHET FEED AND DETENT LEVERS away from the

RATCHET WHEEL. Mounted on the RIBBON REVERSE SHAFT is the

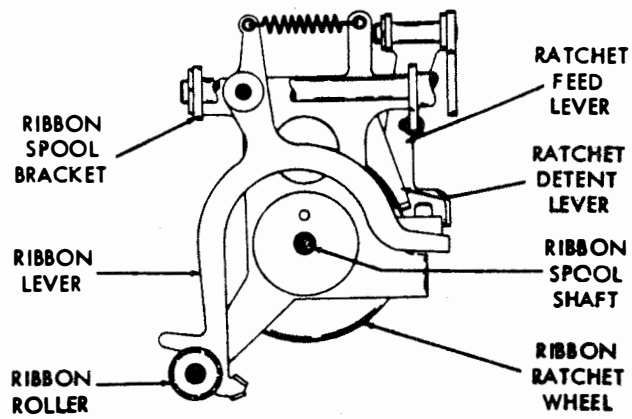
TOGGLE LINK which will be held in one of its two buckled positions by the

RIBBON REVERSE DETENT LEVER which is held toward the front of the typer by the

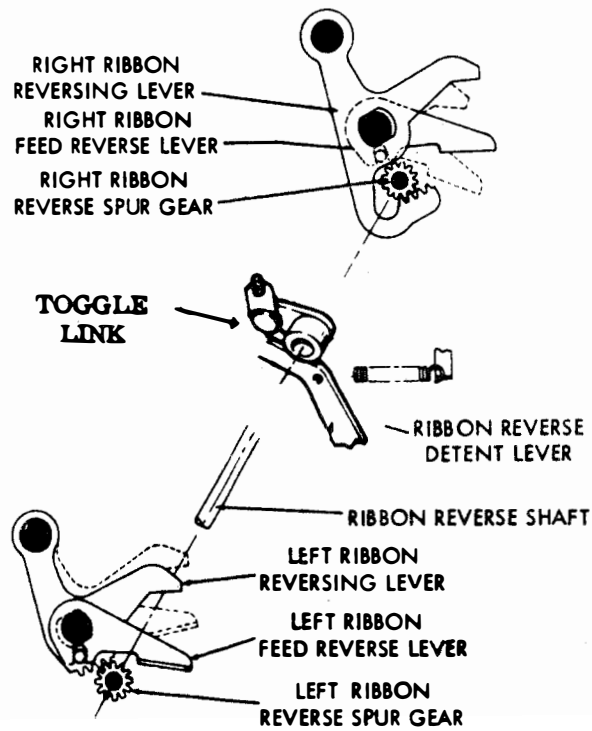
RIBBON REVERSE DETENT LEVER SPRING.



Ribbon Feeding Mechanism



Ribbon Mechanism (Left Top View)



RIBBON REVERSING MECHANISM

LINE FEED MECHANISMS AND SPACING
SUPPRESSION ON SINGLE LINE FEED

INTRODUCTION

The objective of this information sheet is to teach the operating procedure of single, double, local, and manual line feed, and how spacing suppression on single line feed occurs. Proper terminology will be used.

REFERENCE

Navships 0967-059-9010 Volume I Section 573-115-100, pages 36-41

INFORMATION

Line Feed

The LINE FEED combination is selected, the LINE FEED FUNCTION BAR, PAWL, and LEVER operate, and the lower end of the FUNCTION LEVER engages the

LINE FEED SLIDE ARM, pushing it forward and operating the

LINE FEED CLUTCH TRIP ARM, which moves the

LINE FEED CLUTCH TRIP LEVER out of the path of the

LINE FEED CLUTCH SHOE LEVER, releasing the

LINE FEED CLUTCH. This action will allow the

LINE FEED CLUTCH SPUR GEAR to rotate, meshing with and rotating the

LINE FEED ECCENTRIC SPUR GEAR, which rotates the attached

LINE FEED ECCENTRICS actuating the

LINE FEED BARS, using the medium of the

LINE FEED BAR BELL CRANK and the LINE FEED ECCENTRICS as pivots. The

LINE FEED BAR which is all the way up will engage the

LINE FEED SPUR GEAR and move down, rotating the

PLATEN.

The other LINE FEED BAR will travel up, engage the LINE FEED SPUR GEAR, and ready to rotate the PLATEN the next time LINE FEED is selected.

Single-Double Line Feed

Normal operation of the AN/UGC-20 will give double line feed. To obtain SINGLE LINE FEED, the

SINGLE-DOUBLE LINE FEED LEVER is moved toward the front of the machine rotating the

OPERATING ARM CCW (as viewed from the left), allowing the

STRIPPER BAIL ARM, under the tension of its spring, to move to the right (viewed from the rear), into the slot of the

LINE FEED FUNCTION PAWL STRIPPER. The

LINE FEED CLUTCH has the

LINE FEED CLUTCH CAM DISK. This has three high positions. Riding on the CAM DISK is the

STRIPPER BAIL, which imparts an upward motion to the

STRIPPER BAIL ARM, which in turn imparts an upward motion to the

LINE FEED FUNCTION PAWL STRIPPER, which rides up and down on the

STRIPPER BLADE and will strip the

LINE FEED FUNCTION PAWL before regular stripping by the

STRIPPER BLADE takes place, which prevents more than 1/3 revolution of the line feed clutch.

As the

LINE FEED FUNCTION PAWL is stripped off, the

LINE FEED CLUTCH TRIP LEVER SPRING rotates the

LINE FEED CLUTCH TRIP LEVER BACK into the path of the

LINE FEED CLUTCH SHOE LEVER disengaging the

LINE FEED CLUTCH. The

LINE FEED CLUTCH TRIP LEVER takes the

LINE FEED CLUTCH TRIP ARM and the

LINE FEED SLIDE ARM back to their normal stop positions.

Local Line Feed

When the

LOCAL LINE FEED KEY & KEYLEVER are depressed, the front of the

LOCAL LINE FEED FUNCTION LEVER goes down, the rear up, causing the forward end of the

LOCAL LINE FEED BAIL to go up. The

LOCAL LINE FEED BAIL pivots, the top portion moving the

LOCAL LINE FEED TRIP LINK toward the rear, where it comes into contact with and moves the

LINE FEED CLUTCH TRIP LEVER (on the automatic typer) out of engagement with the

LINE FEED CLUTCH SHOE LEVER, permitting the LINE FEED CLUTCH to engage and feed the paper. Thus, we can feed paper locally without disturbing the signal line. To reset the local line feed train of parts, the

LOCAL LINE FEED TRIP LINK SPRING moves the LOCAL LINE FEED TRIP LINK forward, which causes the LOCAL LINE FEED BAIL to pivot, the front portion going down. The rear of the

LOCAL LINE FEED FUNCTION LEVER moving down under the power of its own spring, the front going up and moving the

LOCAL LINE FEED KEY and KEYLEVER up to their normal stop position. As soon as the LOCAL LINE FEED TRIP LINK SPRING moves the LOCAL LINE FEED TRIP LINK forward, the

LINE FEED CLUTCH TRIP LEVER SPRING moves the LINE FEED CLUTCH TRIP LEVER back into the path of the LINE FEED CLUTCH SHOE LEVER causing it to disengage.

Manual Line Feed

The

PLATEN HANDWHEEL is depressed and rotates the

PLATEN HANDWHEEL LEVER which moves down on the

LINE FEED BAR RELEASE LEVER which moves the

LINE FEED BAR BELL CRANK to the rear. It, in turn moves the

LINE FEED BARS out of engagement with the

LINE FEED SPUR GEAR.

The

PLATEN HANDWHEEL SPUR GEAR is meshed with the

PLATEN IDLER SPUR GEAR which meshes with and moves the
PLATEN SPUR GEAR on the PLATEN SHAFT, thus rotating the
PLATEN and feeding the paper.

Spacing Suppression on Single Line Feed

Since the LINE FEED FUNCTION PAWL is stripped before spacing is suppressed, it is necessary to have another FUNCTION BAR, PAWL and LEVER. These operate everytime LINE FEED is selected. Their only purpose is for the bottom of the FUNCTION LEVER to effect "SPACING SUPPRESSION on SINGLE LINE FEED".

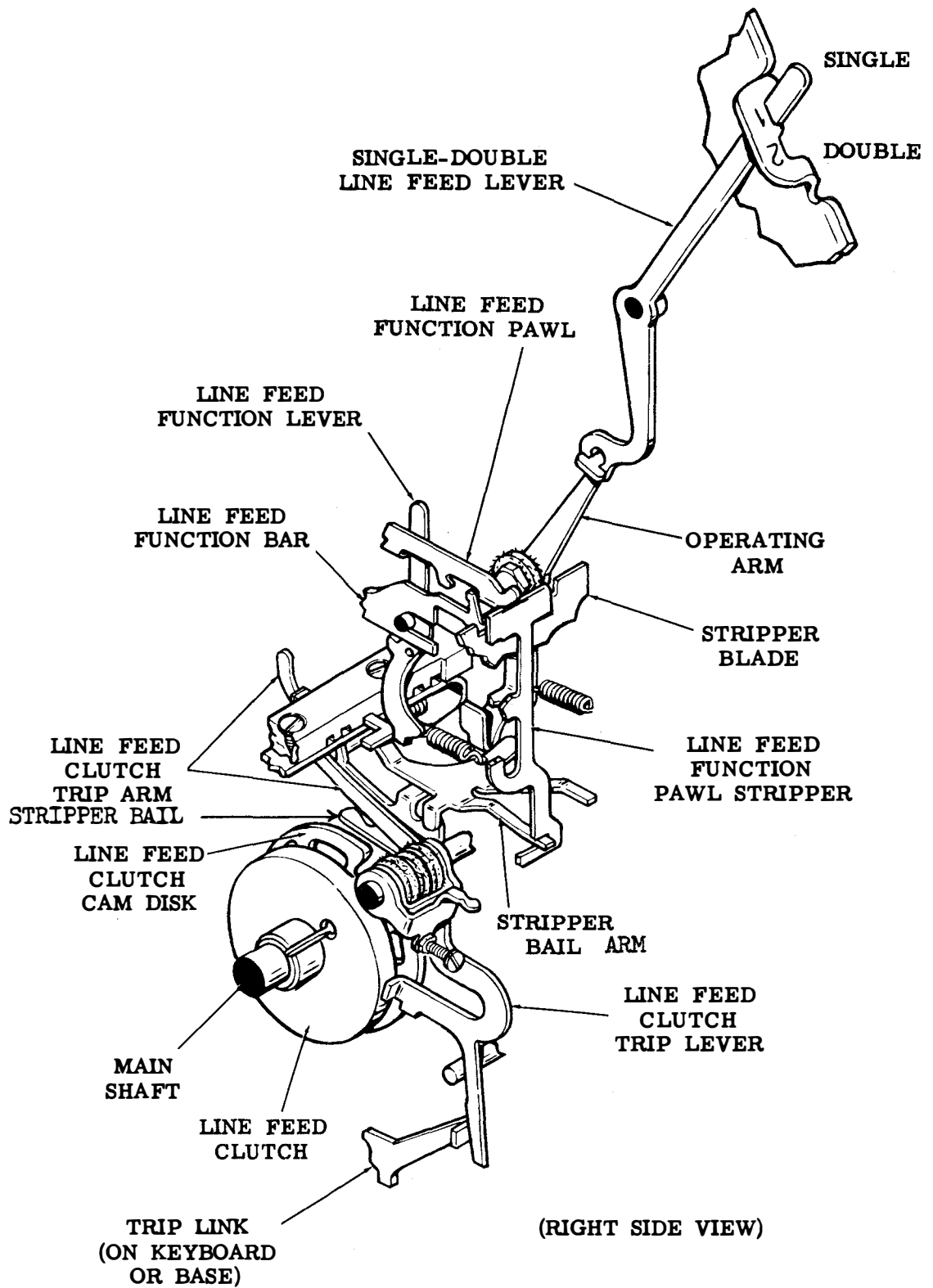
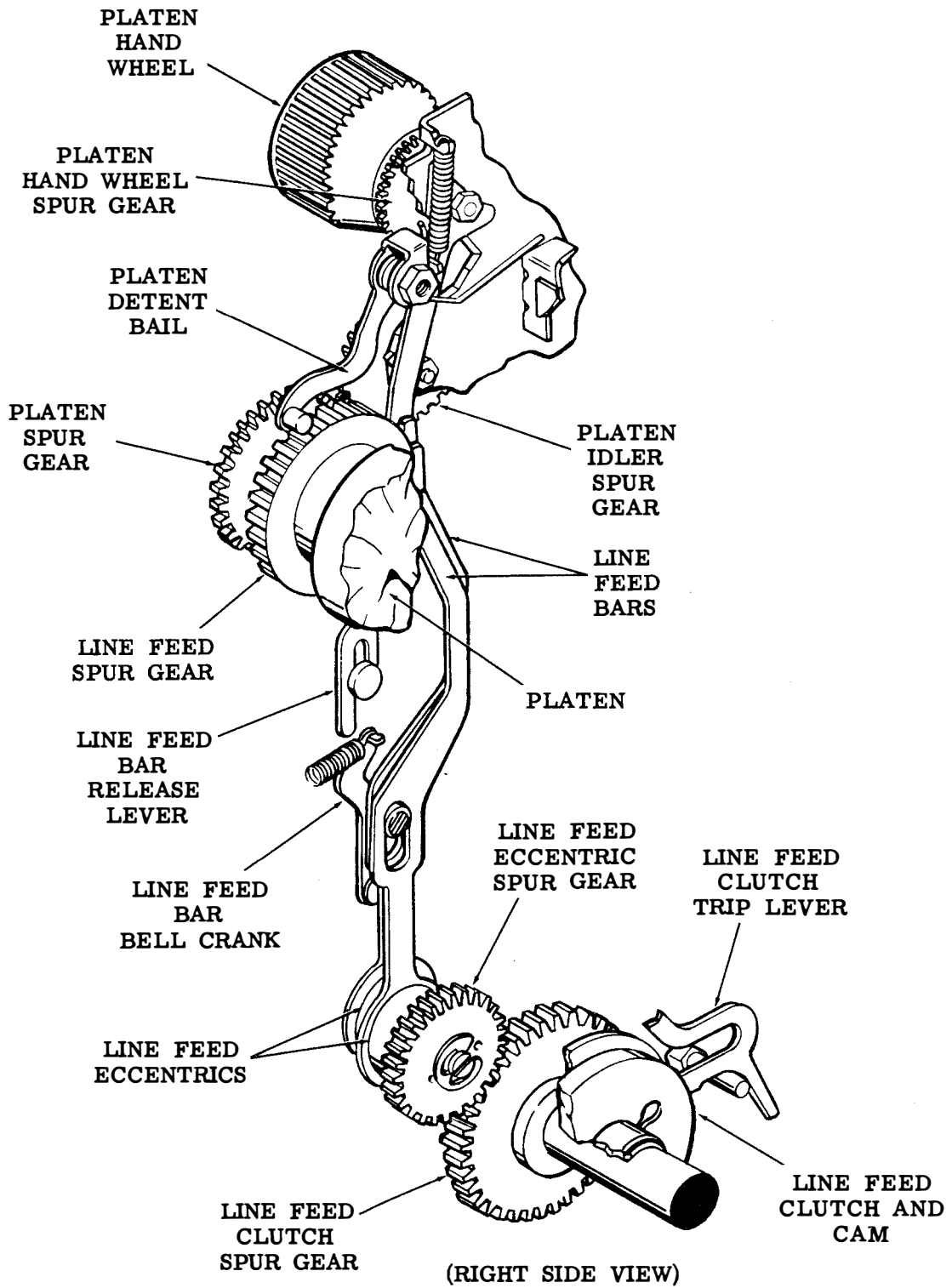
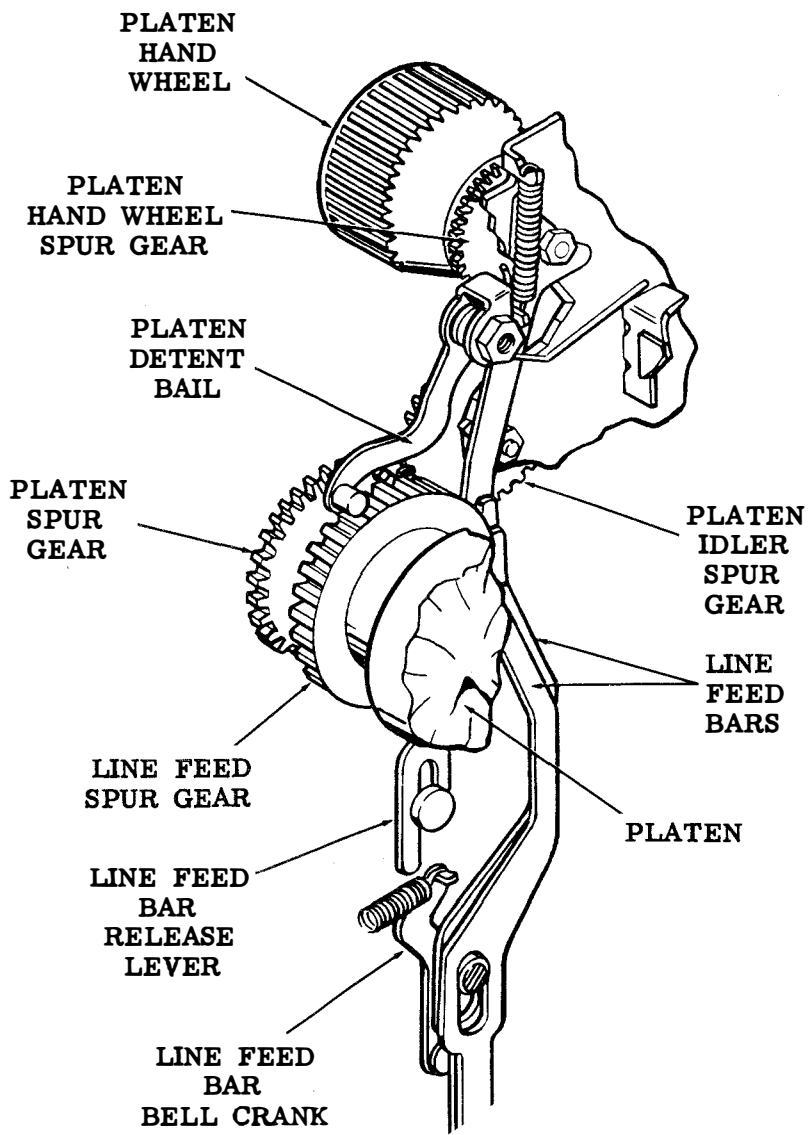


Figure 37 - Line Feed Mechanism



Line Feed Mechanism



(FRONT RIGHT VIEW)

MANUAL LINE FEED

NORMAL AND LOCAL CARRIAGE RETURN

INTRODUCTION

The objective of this information sheet is to teach the operating procedure of the normal carriage return function and the local carriage return mechanism using correct terminology.

REFERENCE

Navships 0967-059-9010 Section 573-115-100 pages 36-37

INFORMATION

Normal Carriage Return Function

The CARRIAGE RETURN combination is selected and the CARRIAGE RETURN FUNCTION BAR, PAWL, and LEVER operate, or become selected.

Near the end of the first one-half revolution of the FUNCTION CAM. The STRIPPER BLADE rotates the CARRIAGE RETURN FUNCTION LEVER LATCH, top to the rear, bottom to the front. The lower end of the

CARRIAGE RETURN FUNCTION LEVER engages and moves the

CARRIAGE RETURN SLIDE ARM forward, which is encompassed around and moves the top of the

CARRIAGE RETURN BAIL forward, which is attached to and moves the

CARRIAGE RETURN LEVER front end down, moving the

SPACING DRUM FEED PAWL RELEASE LINKS to disengage the

SPACING DRUM FEED PAWLS from the

SPACING DRUM RATCHET, and allowing the

SPACING DRUM to rotate CCW, moved by the

DRAW WIRE ROPE.

The CARRIAGE RETURN SPRING DRUM, pulling on the

DRAW WIRE ROPE, returns the

TYPE BOX CARRIAGE and PRINTING CARRIAGE to the left. The

CARRIAGE RETURN LEVER is locked down by the

CARRIAGE RETURN LATCH BAIL and is held there until the carriage has completely returned to the left and the

SPACING DRUM STOP RING PROJECTION strikes the CARRIAGE RETURN LATCH BAIL PLATE, which releases the CARRIAGE RETURN LEVER. When the carriage is returned, stripping is accomplished and the CARRIAGE RETURN FUNCTION PAWL is freed to return to its unoperated position. The CARRIAGE RETURN FUNCTION LEVER is still being held top to the rear, bottom to the front, by the CARRIAGE RETURN FUNCTION LEVER LATCH, which has rotated top to the front, latching the CARRIAGE RETURN FUNCTION LEVER in its operated position as the STRIPPER BLADE moved up to strip off the CARRIAGE RETURN FUNCTION PAWL

To prevent shock when the carriage returns, attached to the SPACING DRUM STOP ARM IS THE

SPACING DRUM STOP ARM ROLLER which strikes the

TRANSFER SLIDE which is attached to and forces the DASHPOT PISTON into the

DASHPOT, compressing the air in the enclosed cylinder, thereby bringing the PRINTING CARRIAGE and TYPE BOX CARRIAGE to a cushioned stop on the left side of the machine. The CARRIAGE RETURN FUNCTION LEVER will remain latched until the next downward movement of the STRIPPER BLADE, when the CARRIAGE RETURN FUNCTION LEVER LATCH will be rotated top to the rear, releasing the CARRIAGE RETURN FUNCTION LEVER, allowing it to return to its unoperated position.

Local Carriage Return

The LOCAL CARRIAGE RETURN enables the operator to obtain CARRIAGE RETURN without interfering with the signal line. When the

LOCAL CARRIAGE RETURN KEY & KEYLEVER are depressed, they move the front end of the

LOCAL CARRIAGE RETURN FUNCTION LEVER down, the rear up, causing the

LOCAL CARRIAGE RETURN BAIL to rotate CCW (as viewed from the left). The upper portion of the

LOCAL CARRIAGE RETURN BAIL comes into contact with and moves the

CARRIAGE RETURN LEVER on the AUTOMATIC TYPewriter, where-upon carriage return is effected in the same manner as for normal carriage return. In resetting the LOCAL CARRIAGE RETURN train, the

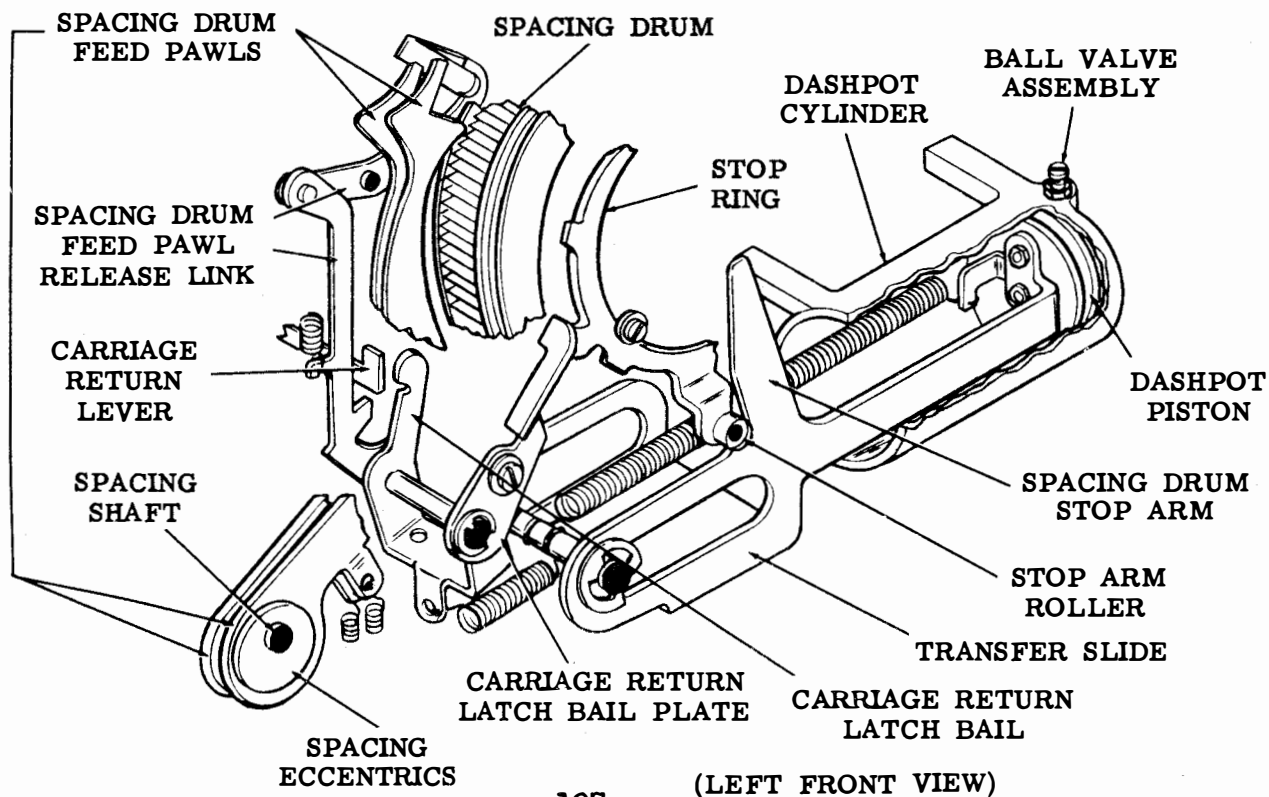
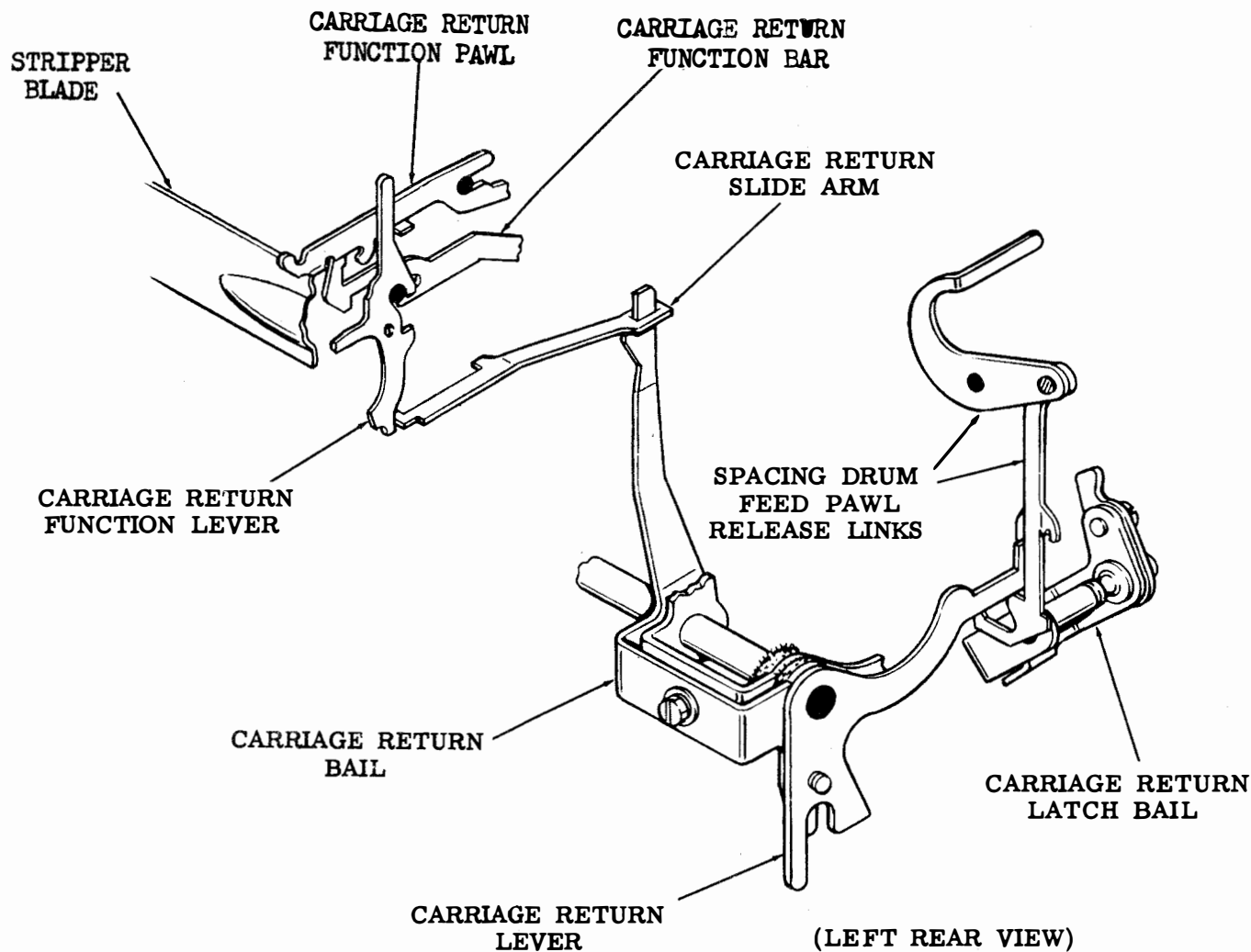
LOCAL CARRIAGE RETURN BAIL SPRING causes the

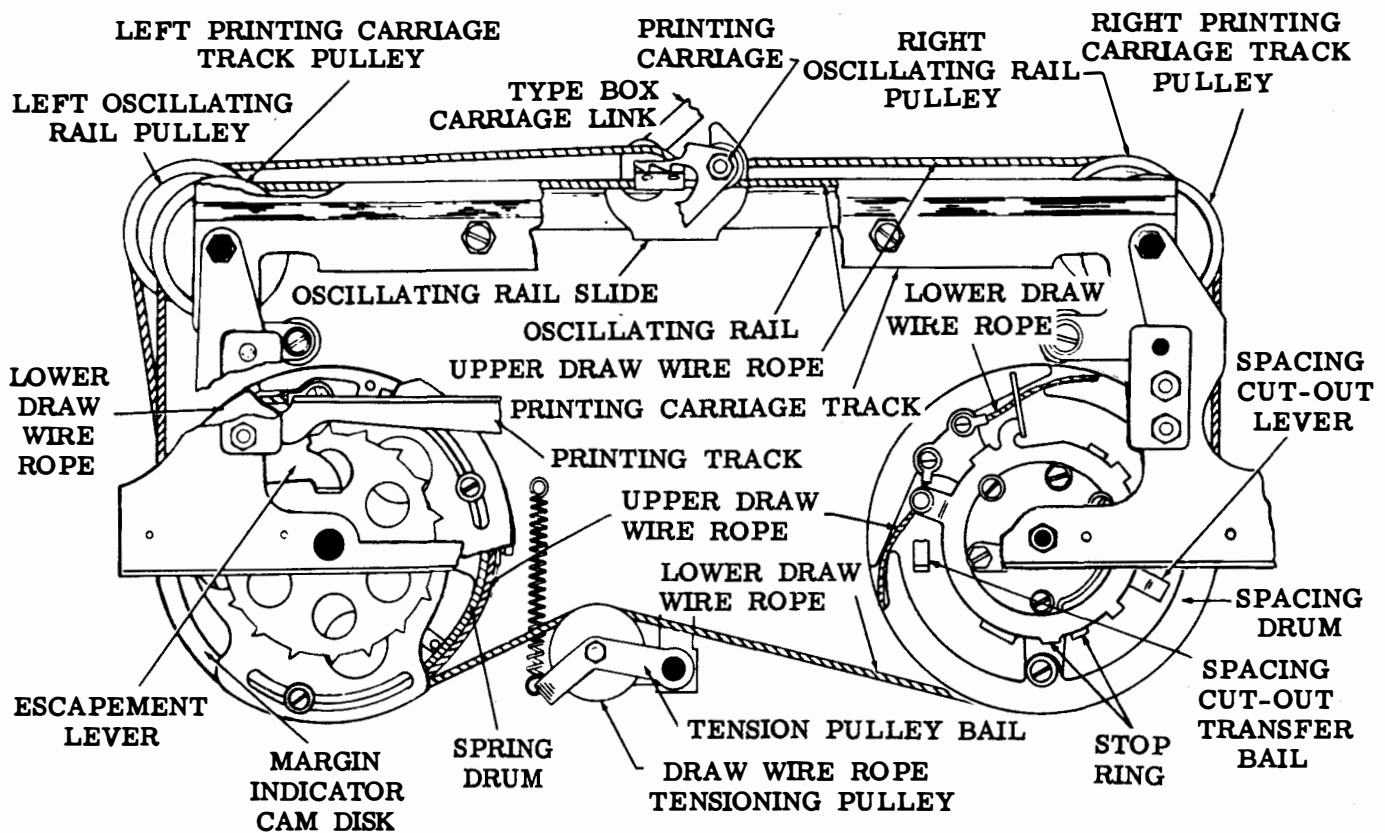
LOCAL CARRIAGE RETURN BAIL TO ROTATE CW (viewed from the left). The

LOCAL CARRIAGE RETURN FUNCTION LEVER rotates CCW (viewed from the left), under the power of its own spring taking the

LOCAL CARRIAGE RETURN KEY, AND KEYLEVER up to their normal stop, or unoperated position. The

CARRIAGE RETURN MECHANISM is reset as covered previously.





Draw Wire Rope and Drums

LETTERS FIGURES SHIFT FUNCTION

INTRODUCTION

The objective of this information sheet is to teach the operating procedure of the letter-figures shift mechanism. The unshift on space function will also be explained and how to disable it since this function is not normally used on Naval ships. Proper terminology will be used throughout.

REFERENCE

Navships 0967-059-9010, Section 573-115-100 pages 20-21, 47

INFORMATION

Letters-Figures Shift

As the LETTERS combination is set up on the CODE BARS, the LETTERS FUNCTION BAR, PAWL, & LEVER operate or become selected. The LETTERS FUNCTION LEVER moves top to the rear, pulling the LETTERS FUNCTION SLIDE which cams against and moves the LETTERS-FIGURES CODE BAR FORK to the right. Riding in the fork is the the projection of the BRACKET which is bolted to the LETTERS-FIGURES SHIFT CODE BAR (also called the "S" CODE BAR) which, with its slotted extension, also moves to the right, which moves the LETTERS FIGURES SHIFT SLIDE to the right, positioning the bottom of the LEFT SHIFT LINK BREAKER SLIDE to the right, into the path of the LEFT SHIFT LINK BREAKER SLIDE BAIL and the RIGHT SHIFT LINK BREAKER SLIDE out of the path of the RIGHT BREAKER SLIDE BAIL.

Both BREAKER SLIDE BAILS are attached to the MAIN BAIL. On its upward travel the LEFT SHIFT LINK BREAKER SLIDE BAIL strikes the LEFT SHIFT LINK BREAKER SLIDE, moving it up, and causing it to strike the

LEFT OSCILLATING RAIL SHIFT LINK, causing it to buckle up, and the RIGHT OSCILLATING RAIL SHIFT LINK will straighten. This action causes the

OSCILLATING RAIL to be shifted to the right for the printing of LETTERS

The Figures Function is accomplished in the same manner with the RIGHT SHIFT LINK BREAKER SLIDE being in the path of the RIGHT SHIFT LINK BREAKER SLIDE BAIL, causing the RIGHT OSCILLATING RAIL SHIFT LINK to buckle, the LEFT OSCILLATING RAIL SHIFT LINK to straighten, and causing the OSCILLATING RAIL to move to the left for FIGURES.

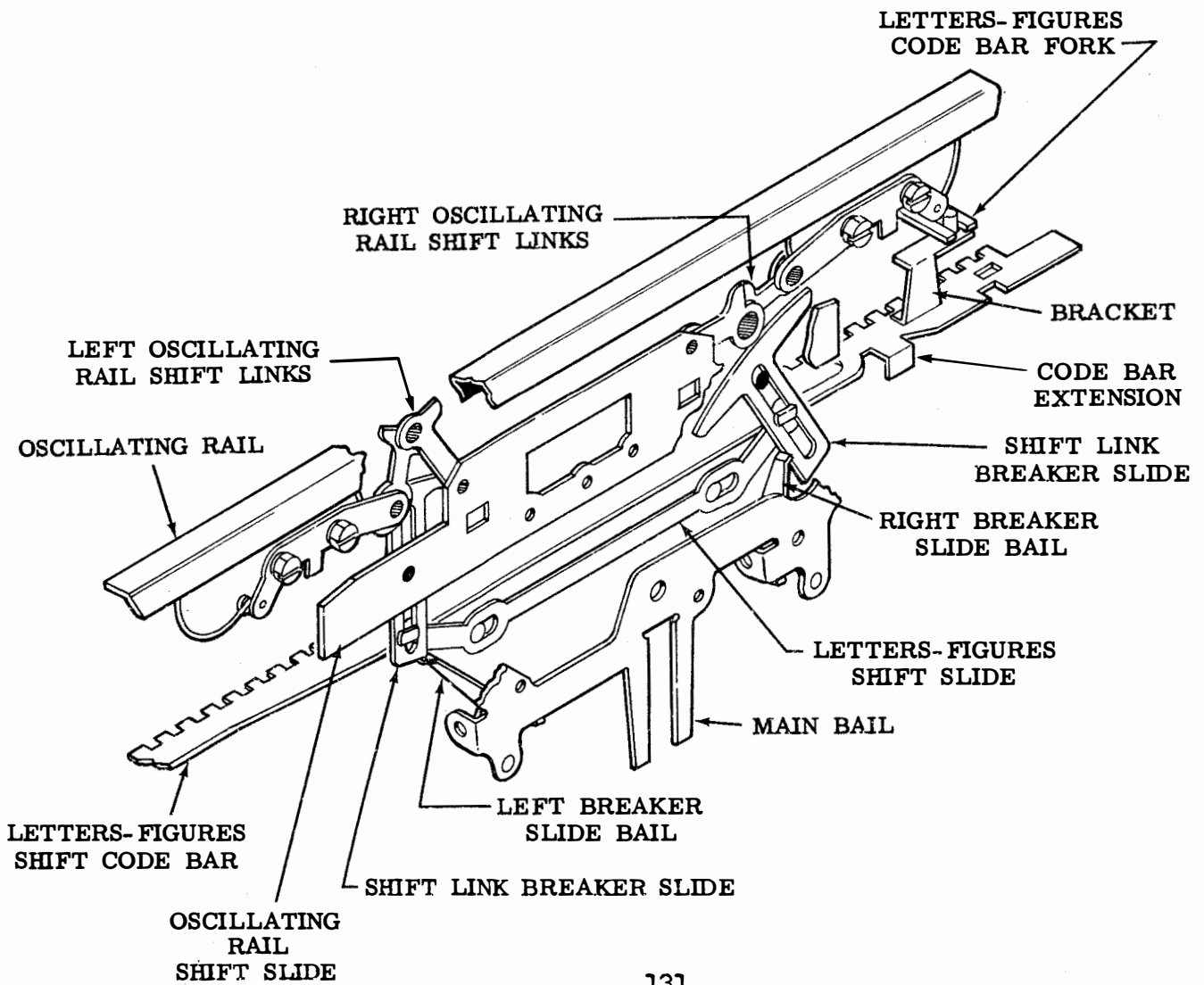
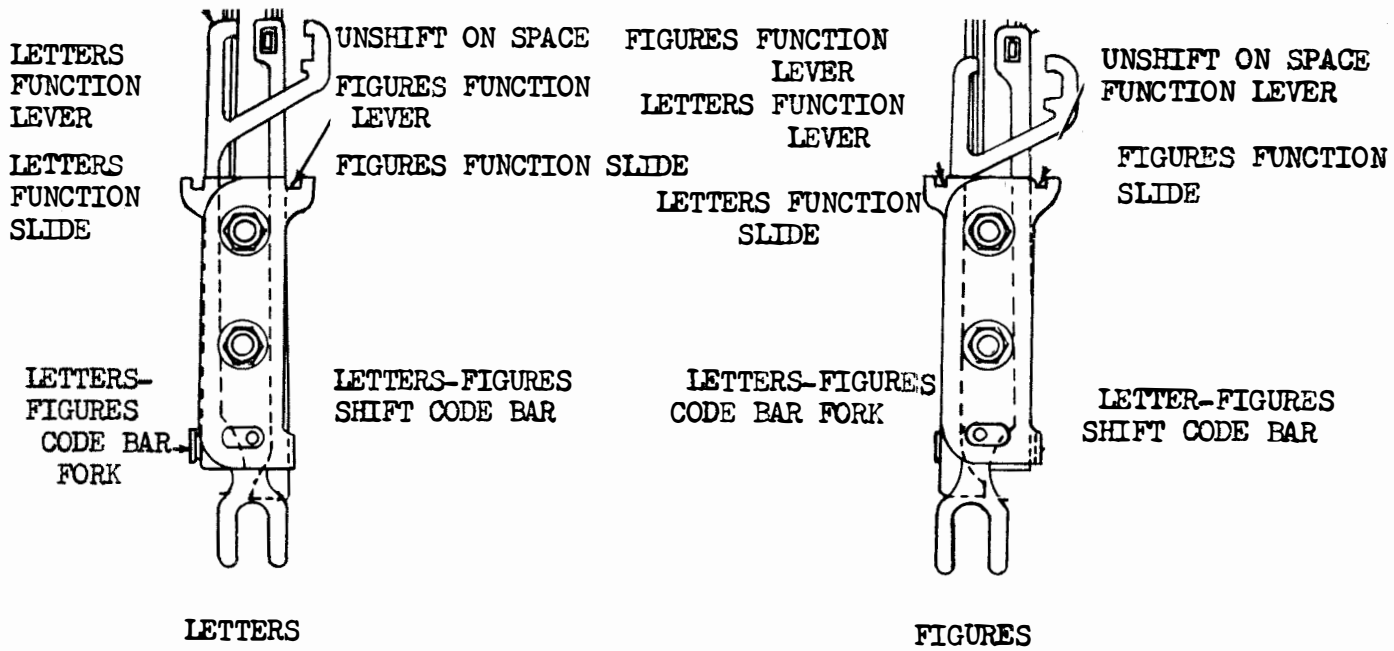
Unshift on Space

The UNSHIFT ON SPACE train of parts will cause the machine to shift from FIGURES to LETTERS when a SPACE (which is a function caused by transmitting station operator striking his SPACE BAR) is received. The first one-half operation is the same as all other functions. Near the end of the first half revolution of the FUNCTION CAM, the top of the

UNSHIFT ON SPACE FUNCTION LEVER will take the

LETTERS FUNCTION SLIDE to the rear and activate the same train of parts that was used in LETTERS-FIGURES SHIFT when the LETTERS combination was selected.

Normally, this function is not used on Naval ships, and it can be disabled by turning a screw, located over the front end of the FUNCTION PAWL, downward until the rear end of the FUNCTION PAWL is raised high enough to clear the FUNCTION BAR. Thus it cannot drop over the FUNCTION BAR and activate the train of parts.



SELF-TEST ITEMS ON THE MODEL AN/UGC-20

INFORMATION

Answer the following questions and place your answers on this sheet. Refer to the technical manual and trainee's guide as necessary. Your work will be reviewed in the class room by the instructor.

REFERENCES

Navships 0967-059-9010 Volume I Technical Manual 28 compact Keyboard Send-Receive (KSR) Teletypewriter Sets

QUESTIONS

1. In what direction is the stripper blade moving when the high side of the function clutch eccentric is moving to the rear?
2. When the stripper blade reaches its normal stop position the spacing suppression slide is moving _____ and is powered by _____.
3. Starting with the function bar, explain how the signal bell is activated.
4. In what direction is the "S" code bar moving when the LTRS function bar is going towards the rear?
5. When the LTRS function pawl is stripped, the LTRS function slide will move _____ under the power of _____.
6. When the right shift link breaker slide is moving up, the type box is moving _____ and you will print in the _____ side of the type box.
7. Another name for the "S" code bar is _____.
8. In what direction will the printing carriage move if the carriage return slide arm is moved forward?
9. In which direction will the carriage return latch bail move if the local carriage return bail is moving to the rear?
10. In what direction will the spacing drum feed pawls be moved (front view) when the carriage return function lever is rotated CW, as viewed from the right?

AUTOMATIC CARRIAGE RETURN AND LINE FEED,
and SPACING CUT-OUT MECHANISM

INTRODUCTION

The objective of this information sheet is to teach the operating procedure of the automatic carriage return and line feed, and spacing cut-out using correct terminology.

REFERENCE

Navships 0967-059-9010 Section 573-115-100 pages 29 and 47

INFORMATION

Automatic Carriage Return and Line Feed

The Automatic Carriage Return and Line Feed have their respective function bars, pawls, levers. The function bars are identical, having only one projection each. They are normally blocked by the AUTOMATIC CARRIAGE RETURN AND LINE FEED CODE BAR.

As the

SPACING DRUM comes to the end of its travel, the

AUTOMATIC CARRIAGE RETURN RING PROJECTION, which is attached to the,

SPACING DRUM, strikes and moves the

AUTOMATIC CARRIAGE RETURN AND AUTOMATIC LINE FEED BELL CRANK in a CW direction and moves the

AUTOMATIC CARRIAGE RETURN AND AUTOMATIC LINE FEED CODE BAR to the right.

The

AUTOMATIC CARRIAGE RETURN AND AUTOMATIC LINE FEED FUNCTION BARS are permitted to enter the

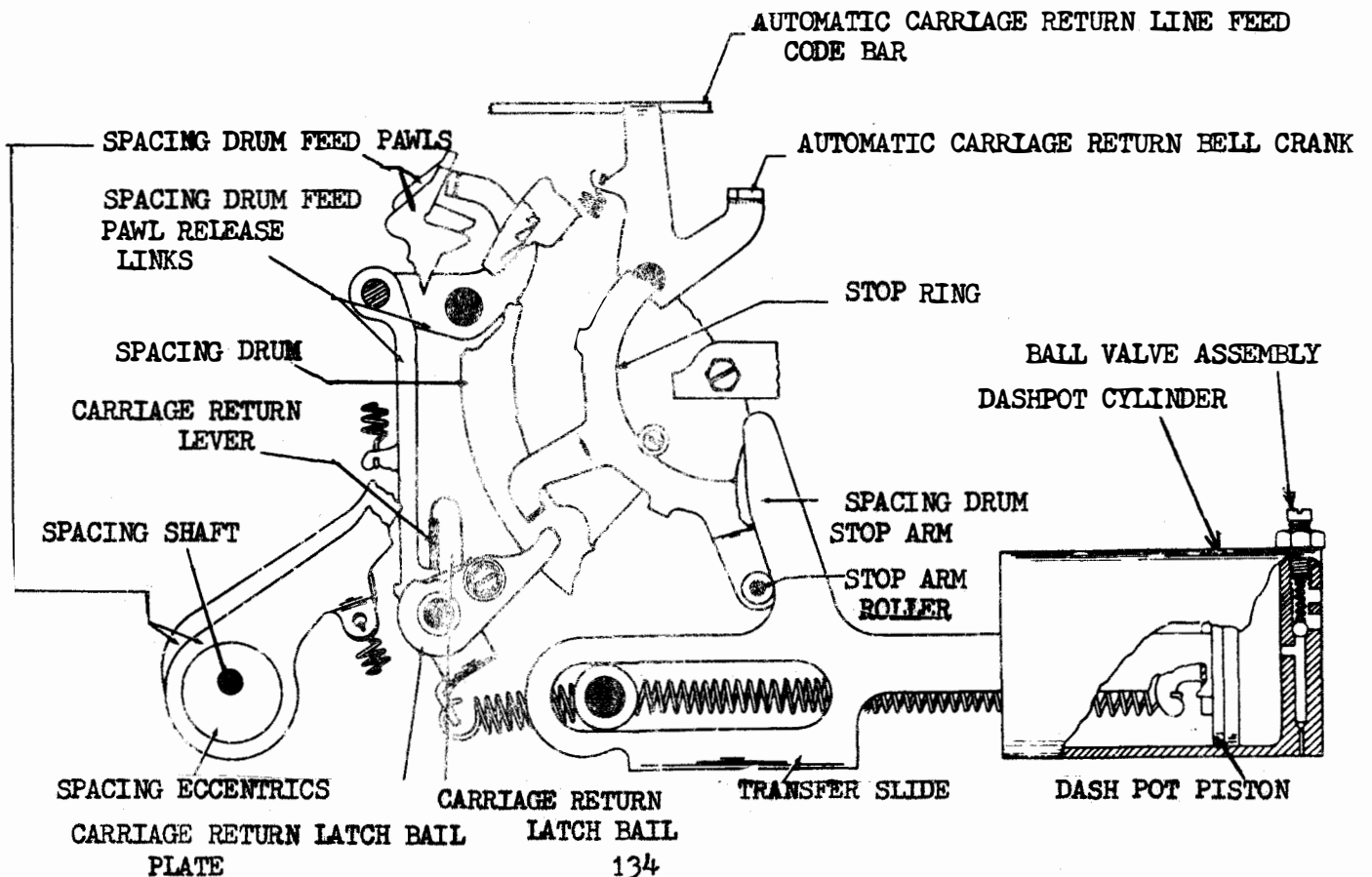
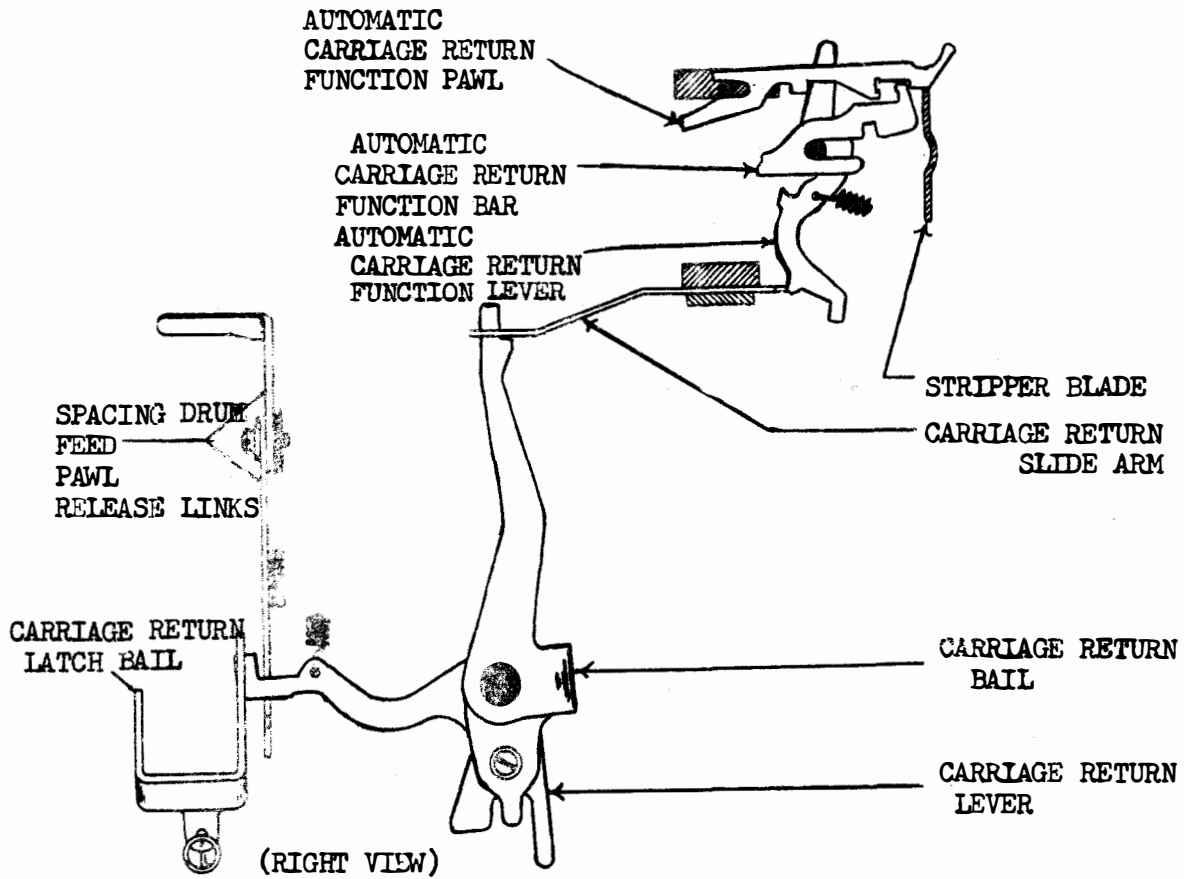
CODE BARS and the REGULAR CARRIAGE RETURN and LINE FEED FUNCTIONS are operated. The AUTOMATIC CARRIAGE RETURN and LINE FEED CODE BAR is also called the "O" CODE BAR.

When AUTOMATIC CARRIAGE RETURN occurs, the

SPACING DRUM rotates CCW, taking the

AUTOMATIC CARRIAGE RETURN RING PROJECTION CCW. This will free and allow the

AUTOMATIC CARRIAGE RETURN AND LINE FEED BELL CRANK to rotate CCW, under the power of its spring, and move the "O" CODE BAR left to its unoperated or restored condition.



SPACING CUT-OUT

If the automatic carriage return fails to operate, there is another safety precaution.

As the

SPACING DRUM nears the end of its rotation, the

SPACING CUT-OUT LEVER strikes and moves the

SPACING CUT-OUT TRANSFER BAIL up in the front, down in the rear. It moves the

SPACING CUT-OUT BAIL forward at the top. Its projection moves the

SPACING SUPPRESSION SLIDE forward, moving the

SPACING TRIP LEVER away from the

SPACING CLUTCH TRIP ARM.

When carriage return is received, the

SPACING CUT-OUT LEVER moves away from the

SPACING CUT-OUT TRANSFER BAIL allowing its spring to rotate it front down rear up. The SPACING CUT-OUT TRANSFER BAIL will then move the

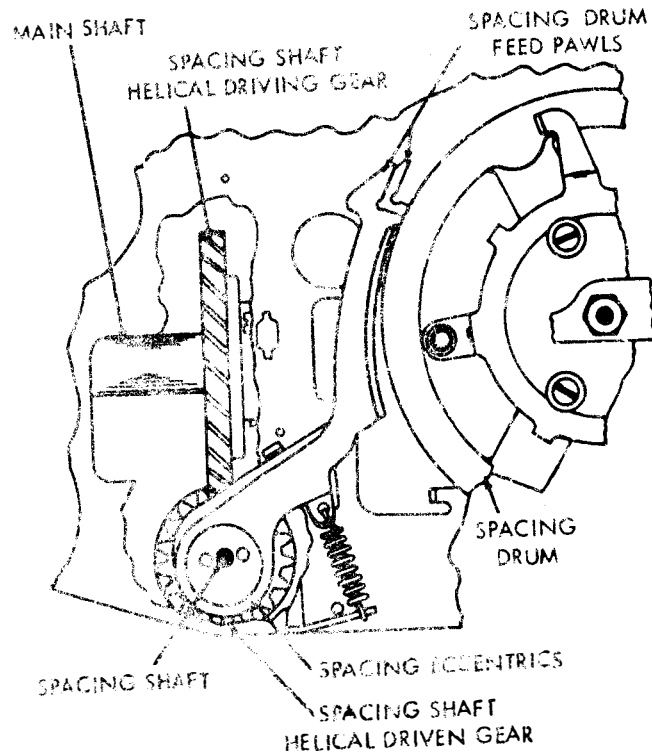
SPACING CUT-OUT BAIL away from the

SPACING SUPPRESSION SLIDE allowing the

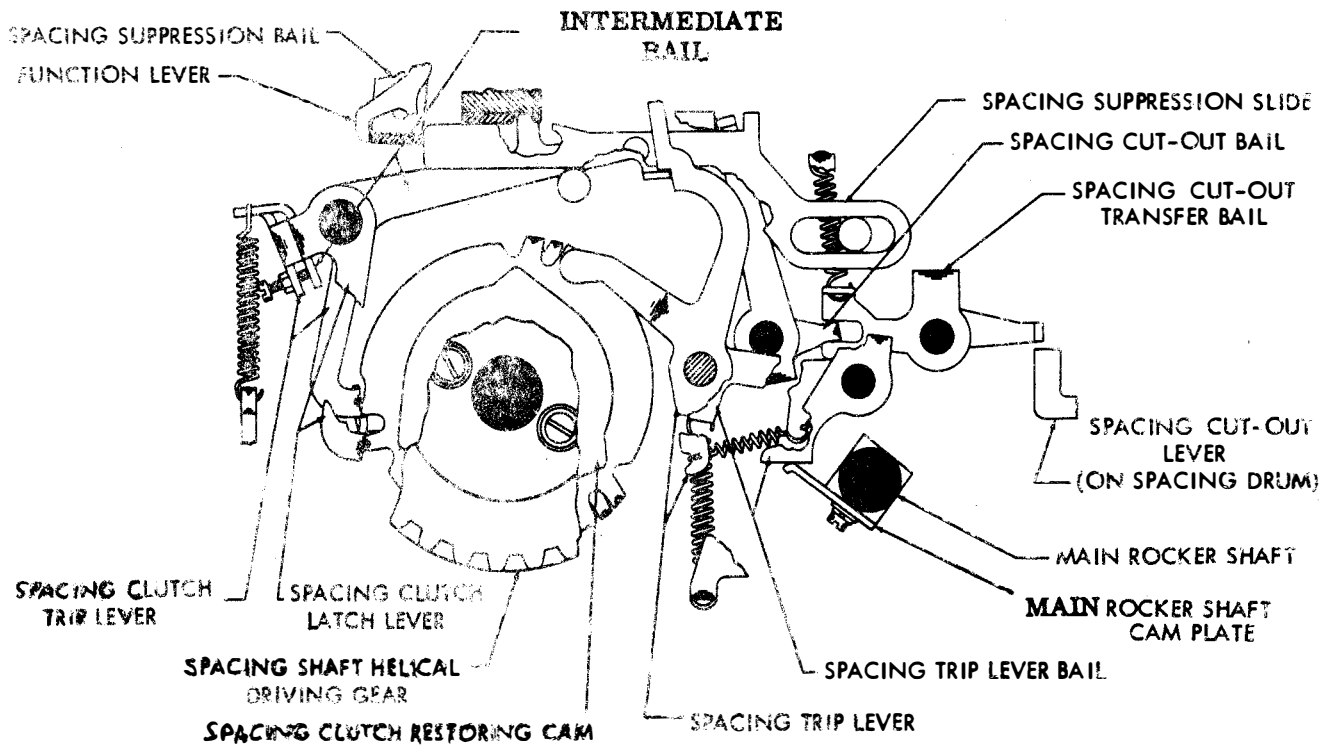
SPACING TRIP LEVER to rotate (top to rear) to its normal stop position and take the

SPACING SUPPRESSION SLIDE to the rear.

In case SPACING CUT-OUT fail to operate, you will notice that there are teeth missing on the SPACING DRUM. After the DRUM has rotated as far as it should go, the SPACING DRUM FEED PAWLS will operate with no effect on the SPACING DRUM.



Spacing Drum Drive Mechanism



Spacing and Spacing Suppression Mechanisms

SELF-TEST ITEMS ON THE MODEL AN/UGC-20

DIRECTIONS

Answer the following questions and place your answers on this sheet. Refer to the technical manual and trainee's guide as necessary. Your work will be reviewed in the classroom by the instructor.

REFERENCES

Navships 0967-059-9010 Technical Manual 28 compact Keyboard Send-Receive (KSR) Teletypewriter Sets

QUESTIONS

1. As viewed from the left and in single line feed position, when the line feed clutch trip lever is moved clockwise by the adjusting screw, the stripper bail will be moving _____, under the power of the _____.
2. During normal line feed operation, the line feed eccentric spur gear will make _____ revolution under the power of the _____.
3. When the line feed bar release lever is moving up, in what direction are the line feed bars moving?
4. During line feed when the upper portion of the spacing trip lever is moving to the front, in what direction is the top of the spacing suppression on single line feed function lever moving??
5. When the automatic carriage return bell crank is in the operated condition, the spacing drum feed pawls will be moved _____.
6. When the spacing cut-out transfer bail is moving up in front, the spacing suppression slide will be moving _____.
7. As the printing carriage nears the end of its movement to the left, the carriage return latch bail plate will be moved _____.
8. The automatic carriage return bell crank is moved counterclockwise by the automatic carriage return bell crank spring. What moves the automatic carriage return bell crank clockwise?

LINE FEED ON CARRIAGE RETURN FUNCTION

INTRODUCTION:

The objective of this information sheet is to teach the operation of LINE FEED during CARRIAGE RETURN FUNCTION, using correct terminology.

REFERENCE: NONE

LOCATION OF MECHANISM:

1. Mounted on top of CODE BAR ASSEMBLY
2. Function Bars, Pawls, and Levers in STUNT BOX slots
#12 - #13 - #14 - #39 - #40.

INFORMATION:

CARRIAGE RETURN

The AN/UGC-20/25 incorporates the necessary machinery to release the LINE FEED CLUTCH during operation of the CARRIAGE RETURN FUNCTION.

CODE BAR ARRANGEMENT

For CR is code bars "1 - 2 - common - 3 - 5" to the right, #4 code bar is to the left, aligning the code bars so that CR #5 Function bar can enter the rear of the code bars.

This code bar arrangement also accomodates the TINE arrangement of of FUNCTION BARS #14 and #39.

Function bars #5 - #14 - #39 are identical in physical construction.

MECHANICAL OPERATION

When the FUNCTION BAR RESET BAIL BLADE moves to the front away from the function bars, during CR function,

the CR function bar #5, the BLOCKING SLIDE function bar #14, and the LF ON CR function bar #39 enter the rear of the code bars, and engage their respective function pawls.

When the function bar reset bail blade move to the rear, moving all operated function bars to the rear, the CR function bar #5 moves to the rear, moving its engaged function pawl to the rear, which engages and moves the CR function lever top to rear bottom to front, initiating the train of parts for CR.

BLOCKING SLIDE function bar #14 moves to the rear, which moves its engaged function pawl to the rear which engages and moves the Blocking Slide function lever #14 top to rear bottom to front.

LF on CR function bar #39 moves to the rear, which moves its engaged function pawl to the rear, which engages and moves LF on CR function lever top to rear bottom to front, the bottom of #39 function lever engages and moves the LF SLIDE ARM, moving it to the front, initiating the train of parts for LINE FEED.

At the time #14 & #39 function bars were moving to the rear, the top of BLOCKING SLIDE FUNCTION LEVER #14, was moving the BLOCKING FUNCTION SLIDE to the rear,

the BLOCKING FUNCTION SLIDE cammed against the BLOCKING SLIDE CAM POST, moving the CAM POST and the BLOCKING SLIDE to the left (rear view)

NOTE: WHEN #14 FUNCTION LEVER WAS COMPLETELY OPERATED (top rear-bottom front) ITS FUNCTION LATCH, LATCHED THE FUNCTION LEVER IN THE OPERATED POSITION.

NOTE: THE BLOCKING SLIDE WAS MOVING LEFT AS THE #5 - #14 - #39 FUNCTION BARS WERE MOVING TO THE REAR.

The BLOCKING SLIDE PROJECTIONS moved to block #39 and #40 function bars from operating, and moved to unblock #12 and #13 function bars.

In this condition the machine has just performed a CR and a LF, the Blocking Slide projections are in position to prevent NORMAL LF OPERATION, and LF on CR FUNCTION - and allow operation of #12 and #13 function bars.

In order to operate a NORMAL LINE FEED or another LF on CR FUNCTION, the machine must operate through two (2) character cycles- after two character cycles the,

BLOCKING SLIDE shifts positions to allow a NORMAL LINE FEED or a LF on CR FUNCTION, operation to be performed.

On the first character cycle after CR, as the function bar reset bail blade moves to the front, away from all function bars, #12 function bar operates to the front.

NOTE: #12 & #13 function bars are called "UNIVERSAL FUNCTION BARS" and do not have TINES as other function bars, therefore operation does not depend on code bar arrangement, but on the BLOCKING SLIDE position.

As #12 function bar operates to the front it picks up its function pawl, when the function bar reset bail blade operates to the rear it moves #12 function bar to the rear, which moves #12 function pawl to the rear, which engages and moves #12 function lever top to rear and bottom to front (or CW rt view)

#12 function lever has an extension which blocks #13 function bar from operating to the front, when #12 function lever moves CW this extension moves away from #13 function bar, freeing it to operate on the next character cycle, and #12 function lever is latched operated by its function latch.

On the second (2nd) character cycle after CR, when the function bar reset bail blade moves to the front, #13 Function Bar moves to front and engages with its function pawl, when #13 function bar is moved to the rear by the the function bar reset bail blade, it moves the #13 function pawl to the rear which engages and moves #13 function lever, top to rear bottom front (CW rt view)

The #14 FUNCTION LATCH STRIPPER (an eccentric post mounted on #13 function lever) moves against the function latch and unlatches #14 function lever.

NOTE: IN THIS CONDITION THE FUNCTION BAR RESET BAIL BLADE IS HOLDING ALL FUNCTION BARS TO THE REAR - THE #14 FUNCTION LEVER IS FREE TO MOVE TO ITS UNOPERATED POSITION "TOP FRONT" UNDER POWER OF ITS SPRING.

As the #14 function lever moves top front, it moves the BLOCKING FUNCTION SLIDE to the front away from the BLOCKING SLIDE CAM POST.

The spring loaded BLOCKING SLIDE is free to move right (rear view) When the blocking slide is returned to its right hand position, its projections will block #12 & #13 function bars from operating and unblock #39 & #40 function bars, in this condition,

the machine can perform a NORMAL LINE FEED or LF on CR FUNCTION.

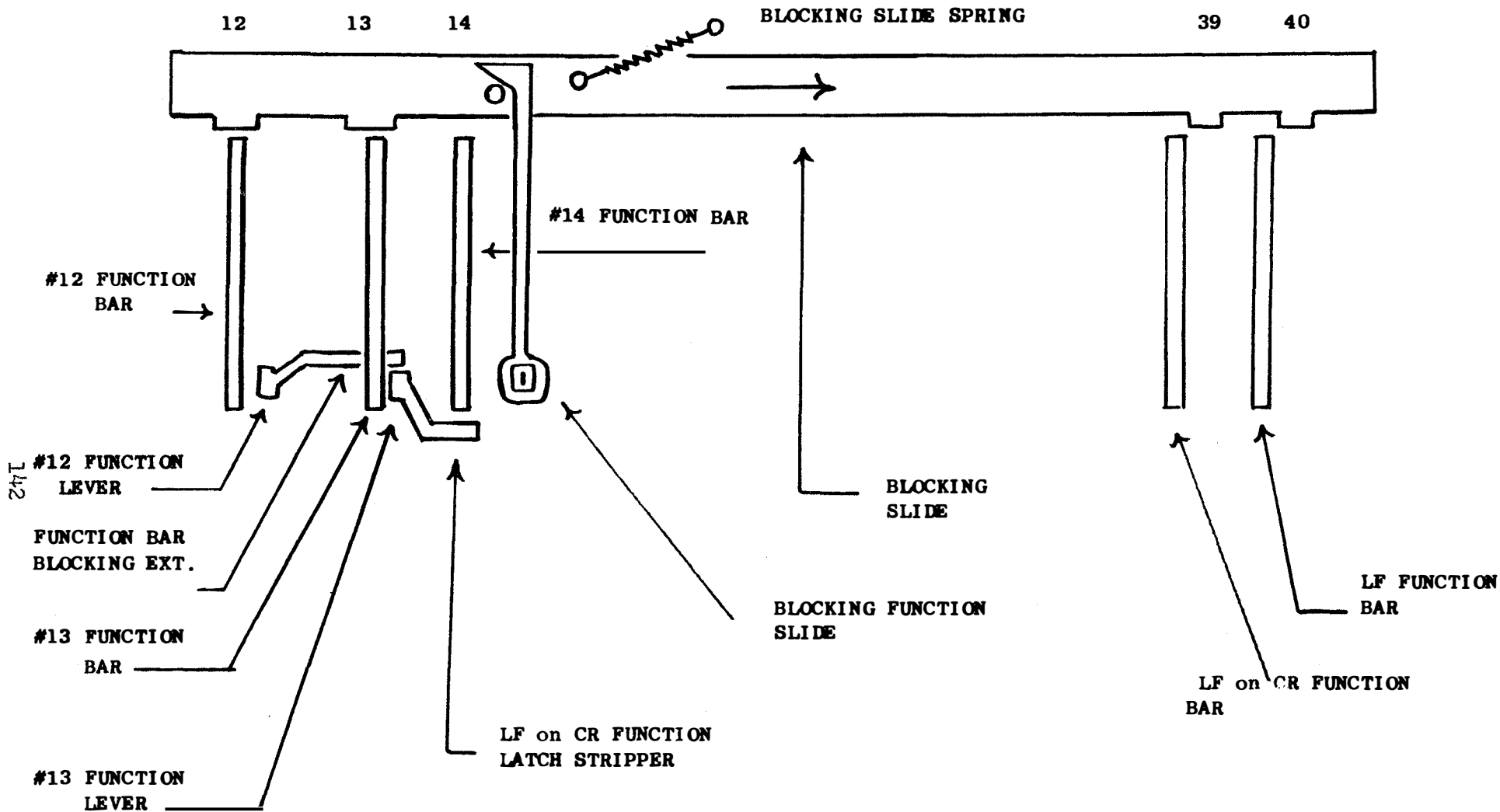
TO ADJUST THE BLOCKING FUNCTION SLIDE

FOR LF ON CR FUNCTION:

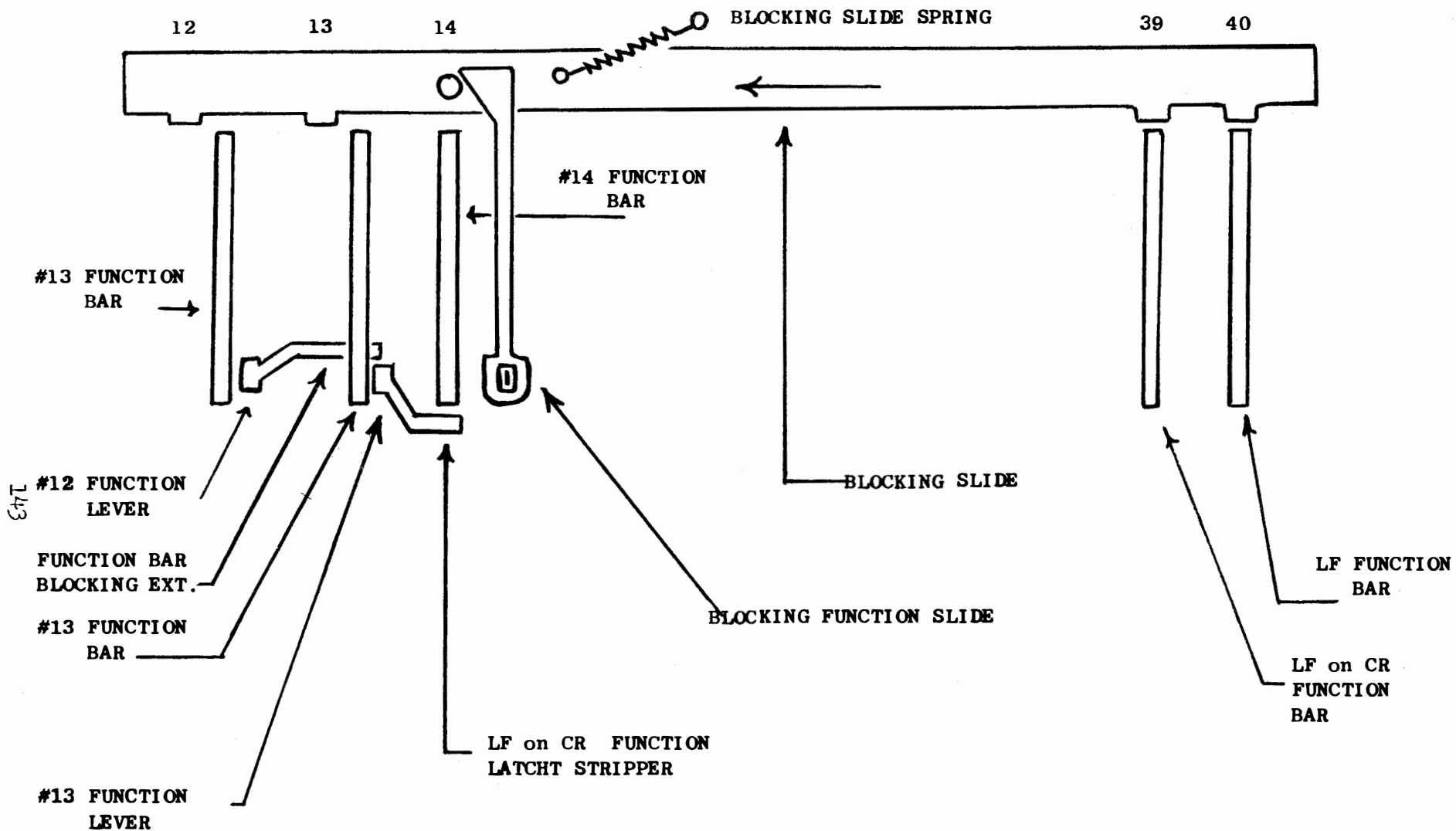
1. #14 function lever to its operated rear position
2. blocking slide projections
 - a. unblocking #12 & #13 function bars
 - b. blocking #39 & #40 function bars
3. Adjustment is accomplished in the same manner as Ltrs/Figs shift adjustment (refer adj. para. 2.31)

TO CHECK ADJUSTMENT

1. #14 function lever to its unoperated front position
2. blocking slide projections
 - a. unblocking #39 & #40 function bars
 - b. blocking #12 & #13 function bars



LINE FEED ON CARRIAGE RETURN MECHANISM UNOPERATED



LINE FEED ON CARRIAGE RETURN MECHANISM OPERATED

TOPIC OBJECTIVES

When you complete this topic, you will be able to:

STATE the purpose of equipment support, EXPLAIN its necessity for proper teletype equipment maintenance.

DETERMINE correct stocking level requirements of space parts using the Allowance Parts List (APL)

DETERMINE the stock number for any part number using the Stock Number Identification Table (SNIT)

DETERMINE whether a stock number is current by using the Stock Number Action Bulletin (SNAB)

CONVERT a part number to a stock number using the Master Cross Reference List (MRRL)

EQUIPMENT SUPPORT

INTRODUCTION

This information sheet will provide you with information on equipment support and the publications used in the procurement of parts

INFORMATION

The purpose of equipment support is to ensure that you have the required space parts on board to help keep down-time of equipment to a bare minimum.

The next duty station that you go to might be a remote shore base or either a ship that deploys on frequent independent duty. Therefore it is imperative that you have the necessary spare parts at your disposal.

To accomplish this mission there is an Allowance Parts List, for each piece of teletype equipment. By using the APL you will be able to determine the correct stocking level requirements of spare parts. The APL also has the information for converting teletype part numbers into Federal Stock Numbers (FSN), but some of the parts listed in the APL do not have the FSM; therefore, you must refer to the Master Cross Reference List (MCRL) which is located in the Supply Office.

The stock Number Identification Table (SNIT) is similar to the APL. It was issued with the earlier design of teletype equipment. It is slowly being phased out. With each new piece of equipment you receive they are issuing the APL instead of the old SNIT.

The Stock Number Action Bulletin (SNAB) is a separate publication that is issued periodically listing stock numbers that have been superseded or deleted. As a new bulletin is issued it will supersede the last issue.

A stock number that has been changed or deleted will remain in the SNAB listing for three years and then will be dropped.

The Master Cross Reference List (MCRL) is a publication that lists all parts by their symbol number or by the teletype number. It consists of approximately fourteen volumes so therefore it would be impractical to issue this to all departments.

On most ships or stations it will only be necessary for you to submit you requisition to the supply department showing only the teletype part number, and the amount needed and they will convert this to the appropriate FSN, determine the cost and order for you.

TOPIC OBJECTIVE

When you complete this topic, you will be able to:

STATE the purpose of the Planned Maintenance System, EXPLAIN its application to the maintenance requirements of the teletype equipment.

STATE the purpose of cycle, weekly, quarterly, and long-range schedules. EXPLAIN and UTILIZE the Weekly Work Schedule and Maintenance Requirement Cards (MRC) to determine maintenance requirements.

PLANNED MAINTENANCE SYSTEM (PMS)

INTRODUCTION

The objective of this information sheet is to present planned maintenance system.

REFERENCE

Opnav 43P2, Maintenance and Material Management (3M) Manual

INFORMATION

The Planned Maintenance System can only be as effective as the Commanding Officer of the ship and the men using it strive to make it. To date, the system has been very well received. Although the system cannot guarantee that failures will not occur, it can certainly reduce them. PMS can also furnish the ship's department heads and the Captain with a management tool for knowing what maintenance is required. When it must be done and whether or not it has been done.

Purpose

The purpose of the Planned Maintenance System is to insure that proper maintenance is performed on all equipment in an orderly fashion.

Administrative Level

Under this system, there are the Planned Maintenance System Manual, the Cycle schedule and the Quarterly Schedule (mounted together on a maintenance control board). These documents are principally used by the Captain and his department heads.

The basic data used by the department head is the Planned Maintenance System Manual. In this manual every component of his department is listed with a description of the least amount maintenance required to keep it operating satisfactorily.

In the manual, the department head finds a page for each component or piece of equipment in his department. By consulting this page he can see at a glance what is needed to maintain each component; the frequency with which the steps must be taken; the rate of the man who can do the work; the safety precautions involved and an indication of how long the job should take.

The Planned Maintenance System Manual is the publication from which all information is taken for the schedules used by the department heads and the men who work on the machinery. The Cycle Schedule, for instance, shows which maintenance measures must be taken for each quarter after a ship's overhaul. All the machines maintenance requirements (except daily and weekly) are noted on this schedule, and all the jobs shown can be done by the men on board with the tools and materials available in the ship.

Long range scheduling of maintenance is accomplished by means of the Quarterly schedules. Two of them (one for the current quarter and the other for the next quarter), posted alongside the Cycle Schedule, make it easy to do long range planning, for maintenance requirements can be transcribed from the Cycle Schedule. This lessens the possibility that maintenance will be scheduled when the ship is at sea when perhaps the machinery scheduled for maintenance can't be dismantled. When the work is done, it is crossed off the schedule. If the work isn't done, the job is circled and rescheduled.

Working Level

Weekly Schedules and Maintenance Requirement Cards are the principal documents required at the working level, which is where the teletypewriter repairman fits into the PMS program.

The Weekly Schedule assigns a specific individual to perform maintenance tasks required on a specific date. The components to be maintained are listed, and the day on which maintenance is to be performed is written opposite the name of the man to do the job. The Weekly Schedule requires simple bookkeeping. If the work is done, it is simply crossed off the schedule. If it has to be rescheduled, the Leading Radioman circles the notation and later reschedules it. He can see at a glance what maintenance work was completed and what is still pending.

When a man sees his name on the Weekly Schedule, it will be opposite the equipment he is expected to maintain. The Weekly Schedule will also show him what maintenance is required and which Maintenance Requirement Card (MRC) he must use while doing the job. The MRC card is pocket-size and lists the maintenance the man is to do; tells him how long the job should take; what tools he will need; the parts and material which are required to perform the maintenance, as well as detailed procedures to follow and safety precautions he must observe.

A set of MRC cards (corresponding with the equipment listed on the weekly schedule is kept in a container installed in each maintenance group work area near the weekly schedule for easy access by maintenance personnel.

There is, of course, a master log kept in the department office. If a card is lost, soiled or torn, it can be easily replaced by filling out and submitting an OPNAV FORM 4790/2L Maintenance Data Form.

Advantages of FMS

Every component in the Planned Maintenance system is readily available in the FMS manual. There are no references to look up, no place else you need to go - it's all there. When the Cycle Schedule is prepared, it is easy to transcribe needed information from it to the Quarterly Schedule. No more effort is required for the Weekly Schedules.

One of the advantages of this system is easy visibility given to the Ship's maintenance Control Board, which can be posted anywhere, but is usually located outside the department office. All the schedules are flexible enough to accommodate employment changes as they occur. The Cycle and Quarterly Schedules combined will give the over-all planned or preventative maintenance program for the ship. The board containing these schedules is known as the Maintenance Control Board.

But what of maintenance records? The schedules themselves are the only records required. The captain has only to look at the quarterly schedule of the various departments for an accurate index of progress in the maintenance program of the command. A cross through the job shows on any schedule indicates the work has been done. If the job is circled, that means the work was not done and must be rescheduled. An excessive number of circles indicates something is wrong somewhere and there is need for corrective action. Some circles, of course are unavoidable. They are of comparatively small consequence, if the work is rescheduled and done in the immediate future.

The Bureau of Ships has an index of the effectiveness of the maintenance which is being performed aboard ship. If there are extensive breakdowns in spite of faithful adherence to maintenance schedules, the Bureau has a basis for asking why - a question which may result in a new contractor being selected to supply the offending components or redesign of the equipment.

TOPIC OBJECTIVES

When you complete this topic you will be able to:

STATE the overall function and purpose of the 3-M system.

PREPARE routine MDCS documents using applicable references.

MAINTENANCE DATA COLLECTION SYSTEM

INTRODUCTION

The objective of this information sheet is to present information on the maintenance data collection system and the forms required in this system.

REFERENCE

OPNAV 43P2, Maintenance and Material Management (3-M) Manual

INFORMATION

The Maintenance Data Collection System (MDCS) is designed to provide a means of recording maintenance actions in substantial detail so that a great variety of information may be retrieved concerning maintenance actions and the performance of equipment involved. In addition to recording maintenance actions performed, the system provides data concerning the initial discovery of the malfunction, how equipment malfunctioned, how many manhours were expended, which equipment was used, what delays were incurred, the reasons for delay, and the technical specialty or rating which performed the maintenance.

The MDCS provides a document on which maintenance personnel record, at the course, designated information concerning planned or corrective maintenance. The information is recorded in a coded configuration which permits machine processing. Each maintenance action will be reported in this manner. Copies of issue documents prepared by supply personnel regarding these actions provide material and cost information to the Data Collection Center. Routine preservation (chipping, painting, and cleaning) will not be reported.

Documentation in the MDCS is accomplished by the completion of one of the forms listed below.

OPNAV FORM 4790/2K, Maintenance Data Form, is a multi-purpose maintenance data collection form used in reporting the completion or deferral of a maintenance action or to request needed assistance. The data elements which must be completed to report any one of these categories of maintenance information have been grouped together in separate, clearly labeled sections of the form, to simplify data recording and to facilitate ADP (Automatic Data Processing).

OPNAV FORM 4790/2L, Supplemental Report form, is a multi-purpose supplemental data collection form used as a MDCS feedback report with which to inquire about, or comment on, any subject related to maintenance accomplishment or maintenance action reporting.

NAVSANDA 1250, Single Line Item Consumption/Management Document is a five part document used to issue material internally in ships which do not have automated (mechanized) supply records. A copy of this form is used to report all maintenance-related material issued.

DD FORM 1348, DOD Single Line Item Requisition System Document, is a single, four or six-part form used for internal issue of material in ships with automated (mechanized) supply records; i.e.; those ships having ADP (Automatic-data-processing) equipment.

Feedback reports are submitted by PMS Installation teams and shipboard personnel in order to point out apparent discrepancies, errors or voids in some aspect of 3M, and to request new or replacement 3M software or hardware.

Complete information for filling in the required information in the above forms is contained in the Maintenance and Material Management (3M) Manual, OPNAV 43P2.

INTRODUCTION TO ADJUSTMENTS (Keyboard)

TOPIC OBJECTIVE:

When you complete this topic you will be able to:

SELECT and utilize the proper tools and gauges for all the adjustments of the AN/UGC-20 as prescribed in the technical manual.

IDENTIFY parts listed in the technical manual by part number.
CONVERT these part numbers into Federal Stock Numbers.

EXPLAIN the procedures related to throwouts, checks and rechecks.

FOLLOW each chapter of the manufactures technical manual,
INTERPRET the instructions and apply this information while making adjustments to the AN/UGC-20.

OBSERVE precautions prescribed in NAVSHIPS Technical Manual, Chapter 9670 Section V, and INSURE that no electrical hazards develop while making adjustments and that the machine is properly handled.

INTRODUCTION:

This information sheet is to guide you in procedure observed in the adjustment phase.

REFERENCE:

Bulletin 284B (NAVSHIPS 0967-059-9010) Technical Manual, Model 28 Compact Teletypewriter Sets, KSR and RO.

INFORMATION:

Introduction

The main purpose of this phase is to provide you with a series of job sheets that will guide you in making various adjustments to certain major components of the AN/UGC-20 Teletypewriter. Another purpose is to provide for graded application.

The adjustable components listed in each job sheet will be maladjusted under the guidance of, or by an instructor.

You will then proceed to make the adjustment following the step-by-step procedures listed on the job sheets and Technical Manual (Bulletin 284B). When working on the job sheets, you may request help from the instructor, as necessary, but you are encouraged to do as much work as possible on your own.

When you have successfully completed this phase you will be able to use the prescribed tools, correctly interpret written directions in the Technical Manual, and perform adjustment to the AN/UGC-20 Teletypewriter. You will also be able to perform the job steps listed on job sheets 1 through 3 which ensure optimum performance of the teletypewriter.

General Procedures

The adjustment items listed on each job sheet will be maladjusted (thrown out) as the first step. You will then proceed to properly readjust your machine following the instructions on the job sheets and the Technical Manual. Some items are not thrown out, however, you will be responsible for their accuracy. You will be assigned a maladjustment (MAL) for each adjustment incorrectly made.

A throwout may affect several trains of parts, therefore it may be impossible to set the machine to the condition required in the technical manual. You should first go over the entire job sheet and make approximate settings, tighten loose nuts, screws, etc. After you have done this and the machine is workable, when turned over by hand, then you will be able to set it up for the required condition and readjust to the tolerance required.

Some job sheets call for a preliminary check. When maladjustments are not pointed out and your machine is free of binds you may proceed with the final portion of the job sheet and/or operate your machine under power. Should a maladjustment or a bind be pointed out, it must be corrected and a preliminary check made by an instructor. Under no circumstances will you operate your machine under power without a preliminary check. Final checks will be made in a similar manner. Maladjustments will be corrected and rechecked before proceeding to the same or other adjustments. When a recheck turns up the same or another maladjustment, you will be required to adjust it and obtain another check.

Included with each Job Sheet is a list of CAUTION POINTS, practical points and helpful hints. Only those items which experience has shown to be difficult are listed. You are encouraged to use your own methods and ingenuity in making adjustments. The CAUTION POINTS should be followed closely to avoid difficulty and/or damage to you machine. Disregard for a CAUTION POINT will earn you a MAL.

When replacement parts are required, the part number will be obtained from the appropriate NAVSHIPS Manual List of Spare Parts. The part number will be placed on a parts request chit and the part drawn from the supply room.

Materials

1. Teletypewriter Set, complete.
2. Set of tools, in drawer

NOTE: The tools furnished are adequate to perform all the adjustments in this school. However, there are other tools available as a complete kit or individual tools. We have included the Teletype Corp. and Federal Stock Numbers found in E.I.B. 646-1-11-65.

WARNING

The following are excerpts from E.I.B.;

Utmost care should be exercised when adjusting the AN/UGC-20 under power due to the presence of 115 volts in the keyboard transmitter and the distributor.

The copy light connector plug, Teletype (TTY) part number 115535 can be forced on its receptacle, TTY part number 114848, in reverse thus placing a 110-volt potential in the printer, base, and cabinet, via the ground wire. All commands concerned should insure that the plug, 115535 and receptacle, 114848, are marked to insure correct installation.

CAUTION: Due to the shortened side frames, the Lp-111 Automatic Typer cannot be rotated to the number three maintenance position. It is stressed once again that no Automatic Typer should ever be rested on the front plate mechanism.

TOPIC OBJECTIVES

When you complete this topic, you will be able to:

FOLLOW a prescribed logical troubleshooting procedure, RECOGNIZE symptoms associated with faulty/maladjusted parts or electrical circuits, DIAGNOSE the symptoms, ISOLATE the area of trouble, LOCALIZE the faulty/maladjusted parts or circuits, DETERMINE the cause of the trouble, and REPAIR the defect.

OBSERVE applicable safety precautions throughout the procedure.

EXPLAIN how to properly fill out a trouble analysis chart.

TROUBLESHOOTING INSTRUCTIONS

INTRODUCTION

The objective of this information sheet is to set forth some basic instructions for the troubleshooting problems that you will be required to perform.

INFORMATION

WARNING: VOLTAGES DANGEROUS TO LIFE EXIST IN THE TELETYPEWRITER SET. USE EXTREME CAUTION WHEN SERVICING THIS EQUIPMENT. IF YOU ARE IN DOUBT ABOUT SAFETY PROCEDURES, DO NOT MAKE ELECTRICAL CHECKS WITHOUT SUPERVISION.

Purpose of Troubleshooting

The purpose of this phase is to put practical use to the knowledge and experience you have acquired so far. You will use your knowledge of the UGC-20 operation, adjustment, wiring, etc., to develop an ability to quickly locate and repair troubles.

As an efficient repairman you should be able to identify, locate and quickly repair any type of trouble which may develop. Knowledge of troubleshooting and trouble isolation methods and conscientious application at all times, will help you attain the ability.

Troubles, used for practice, will be as close to actual troubles encountered in the field as possible. Certain troubles caused worn, bent or broken parts are not easily simulated and therefore, only a limited number of such troubles can be used. However most troubles which do occur, such as maladjusted parts, weak springs, missing screws, nuts, etc., will be used. These troubles can and will give a variety of symptoms which can be diagnosed and the actual trouble located, using the four steps outlined in this course. An attempt has been made to start out with relatively easy troubles and then as you gain experience, use progressively more difficult troubles. Approximately 40 to 50 troubles will be used and the experience gained will, it is hoped give you a good start toward becoming an ace trouble-shooter.

Time is a factor in troubleshooting which is necessary for grading purpose. You should not let the clock effect your method of locating troubles. Remember that time will be a factor in the field too, and sometimes success or failure of a mission will be at stake.

Materials Required for Troubleshooting

The following materials are required for the troubleshooting phase:

- One 6" screwdriver
- One multimeter
- Trainee Guide, Schematic diagrams, class notes and technical manuals as required.
- Alligator clip

All tool drawers will remain closed except when correcting troubles.

Cautions to be Observed

Do not repair or correct troubles until instructed to do so.

Use only those tools prescribed above while shooting troubles.

Place the multimeter in a safe position and observe proper operating procedures for it. A blown fuse will result in loss of time and points.

Remove, or bolt down, typer before lifting machine to look at underside.

Pass to and from lounge as quietly as possible. Do not smoke in the passageway.

SHOOT YOUR OWN MACHINE. Conversation is not allowed between students during the actual shooting of a trouble.

Observe instruction of instructors at all times regarding items not included herein. Chalk boards will be used to promulgate such instructions.

Procedure for Troubleshooting

Troubleshooting can be divided into four steps as follows:

- SYMPTON - Wherein a definite trouble shows itself such as no spacing, no printing, garbling, running open, etc..
- DIAGNOSIS - What could be causing the trouble.
- ISOLATING - The area of the machine where the trouble is located.
- LOCALIZING - The exact location or the name of the part causing the trouble.

As soon as a trouble has been placed on your machine, you will be directed to go to your position and stand facing the front of the room. When the instructor gives the signal, you will proceed to locate the trouble.

When you have localized the trouble you will write what you believe to be the trouble on a trouble shooting chit, being careful to use correct names, sign it, and take it to the instructor. If you are correct, the instructor will send you outside the classroom. If you are incorrect, the instructor will instruct you to continue troubleshooting. When you have been instructed to leave the room, you will not return to your position without permission.

A 15 minute period is allowed to localize the trouble. When the time limit is up, or when all students have localized the trouble, the instructor will instruct the students to repair their machines. After the trouble has been corrected and you are satisfied your machine is again operating normally, you will leave the room and go to the hallway outside the class-room. Another trouble will then be put on your machine.

Recommended troubleshooting procedures for the electrical and mechanical systems of the UGC-20 teletypewriter are located in a Troubleshooting Guide and check Chart in this guide. This guide and check chart is for your use in guiding you toward development of a good system of troubleshooting and should be used with that in mind. It does not attempt to list all of the possible troubles or checks to make. You must utilize your understanding of the machine's operations, adjustments, wiring, etc., to locate the trouble.

A systematic checking off of possible troubles such as this chart will probably locate the trouble eventually, but it is time consuming and frustrating. By using the first 3 steps shown above, you will be able to quickly pinpoint the trouble area. Checks of clearances, spring tensions, binds, and missing parts, etc., will then localize the trouble to a specific area or part. Mal-adjusted parts will be far enough out so gauges will be unnecessary in most cases, as will spring tensions. Do not depend on color codes for electrical troubleshooting as they can mislead you.

TROUBLE SHOOTING GUIDE & CHECK CHART

INTRODUCTION:

The objective of this information sheet is to give you a systematic and logical method for troubleshooting to assist you in RECOGNIZING symptoms associated with faulty/mal-adjusted parts or electrical circuits, DIAGNOSING these symptoms, ISOLATION the area of trouble LOCALIZING the faulty/mal-adjusted part or circuit and DETERMINING the cause of trouble so that the defect can be repaired.

INFORMATION:

There are four major units in the AN/UGC-20: KEYBOARD, TYPER, DISTRIBUTOR and ELECTRICAL points of contact - - PLUS electrical wiring where trouble can develop.

You cannot check all of these units simultaneously.

The following instructions, helpful hints and check charts are designed as a guide to assist the student in developing a system for checking out the entire machine.

TYPER RUNS OPEN - Disregard further instructions on the page and refer to TYPER - RUNS OPEN - column on Check Chart

MACHINE RUNS NORMAL - There is no apparent symptom of trouble - follow the steps outlined below.

1. Type out a test sentence i.e.,
THE QUICK BROWN FOX JUMPED OVER THE
LAZY DOG'S BACK 1234567890 TIMES.
while observing the KBD and TYPER.
2. Select; Blank - E - Line Feed - Space -
Carriage Return - Figures - Bell - Letters.
3. Check all Functions for correct operations.
4. If no symptom of trouble has been discovered refer to "COMMON AREA CHECK" columns on check charts and check all items listed.

TROUBLE SHOOTING CHECK CHART

TYPERS

--RUNS OPEN --

If the typer runs open in line, manually lift the armature against the Selector Magnets. If machine runs closed and all clutches disengage it is logical to assume the trouble is electrical

If the selector Magnets are energized and the clutches do not disengage, it is logical to assume the trouble is mechanical.

OTHER CHECKS -(RUNS OPEN)

1. Range finder setting
2. Distributor contacts
3. KBD contact wires
4. Selector magnets and brackets
5. Distributor Magnet and bracket
6. Line break switch
7. Signal Line circuit - LINE

COMMON AREA CHECKS

1. Margin indicator light
2. End of line light
3. Unshift on space
4. Repeat
5. Ribbon feed operation
6. Left hand margin
7. ON/OFF

NOTE: It is practically impossible to list every possibility of trouble area, you must use your own knowledge of the operation of the AN/UGC-20 and develop your own techniques in trouble shooting. INITIATIVE AND IMAGINATION are two prerequisites in effective trouble shooting.

After completion of check-out step 1 thru 5 and upon determining there is no symptom of trouble, fill out the trouble analysis sheet, state "NO TROUBLE", and report to the instructor. It is possible that the trouble has not taken effect in your equipment. Ensure that you have made all checks required prior to reporting "NO TROUBLE" as it is easy to overlook a check-out step in your haste.

Helpful Hints

Garbling - Determine if the garble is systematic, i.e. A for W everytime. If so, refer to signal code to determine which impulse is being dropped or picked-up. Systematically check out train(s) of parts common to that particular impulse; i.e., If dropping the 5th impulse everytime, check train of parts from #5 code bar in keyboard up thru shifting of the code bars in typer. If trouble is not located with-in the selecting train of parts, proceed to horizontal positioning train of parts (#5 horizontal motion stop slide etc.).

If a part is not being moved correctly, ask yourself "What is the power to move that part?", then start at the power and systematically check train of parts up to mal-functioning part to determine if a part(s) has been mal-adjusted etc..

PRESELECTING A CHARACTER

1. KEY
2. KEYLEVER
3. FRONT BAR
4. REAR BAR
5. RIGHT AND LEFT "T" LEVERS
6. TIE LINK
7. UNIVERSAL CODE BAR
8. UNIVERSAL "T" LEVERS
9. UNIVERSAL TIE LINK
10. UNIVERSAL TIE LINK EXTENSION
11. NON REPEAT LEVER
12. NON REPEAT LEVER TAB
13. LATCH LEVER
14. UNIVERSAL LEVER.
15. CONTACT RESET BAIL
16. CONTACT WIRES
17. CLUTCH TRIP CONTACT WIRE
18. NON REPEAT LEVER
19. LATCH LEVER

DISTRIBUTOR CLUTCH RELEASE AND RESTORE

1. AC THROUGH TIMING CONTACTS TO MAGNETS
2. ARMATURE
3. CLUTCH TRIP LEVER
4. CLUTCH RESET LEVER
5. CLUTCH STOP LEVER
6. CLUTCH SHOE LEVER
7. CLUTCH SHOES
8. CLUTCH DRUM
9. CLUTCH ASSY ROTATES
10. CLUTCH RESET LEVER CAM
11. CLUTCH RESET LEVER
12. CLUTCH TRIP LEVER
13. CLUTCH STOP LEVER
14. TIMING CONTACTS
15. ARMATURE
16. CLUTCH SHOE LEVER
17. CLUTCH LATCH LEVER

RESETTING KBD TRANSMITTER

1. SOLENOID RESET CONTACTS
2. AC TO RESET SOLENOID
3. SOLENOID PLUNGER
4. RESET SHAFT LEVER
5. RESET SHAFT
6. RESET ARM
7. UNIVERSAL LEVER
8. CONTACT RESET BAIL
9. CONTACT WIRES
10. LATCH LEVER

OPERATION OF THE DISTRIBUTOR ASSEMBLY

1. DISTRIBUTOR MAIN SHAFT DRIVE GEAR
2. DISTRIBUTOR MAIN SHAFT
3. CLUTCH DRUM
4. DISTRIBUTOR CLUTCH RELEASED AND ENGAGED
5. DISTRIBUTOR CAM SLEEVE
6. STOP CONTACTS
7. CLUTCH RESET CAM
8. RESET LEVER, TRIP LEVER, STOP LEVER
9. TIMING CONTACTS
10. ARMATURE
11. #1 CODE LEVEL CAM
12. FOLLOWER LEVER
13. ROCKER LEVER
14. #1 CODE LEVEL CONTACTS
15. #1 CODE LEVEL CAM
16. FOLLOWER LEVER
17. ROCKER LEVER
18. #1 CODE LEVEL CONTACTS
19. #2 THRU #5 CODE LEVEL CONTACTS CLOSE AND OPEN
20. SOLENOID RESET CONTACTS
21. STOP CONTACTS
22. SOLENOID RESET CONTACTS
23. TIMING CONTACTS
24. CLUTCH SHOE LEVER
25. CLUTCH LATCH LEVER

SELECTOR CAM CLUTCH RELEASE AND RESTORE

1. START PULSE
2. SELECTOR ARMATURE AND EXTENSION
3. START LEVER
4. START LEVER EXTENSION
5. STOP ARM BAIL
6. STOP ARM
7. CLUTCH SHOE LEVER
8. CLUTCH ASSEMBLY
9. STOP ARM BAIL CAM
10. STOP ARM BAIL
11. START LEVER EXTENSION
12. START LEVER
13. STOP ARM
14. LATCH LEVER
15. ARMATURE

OPERATION OF THE PUSH LEVER RESET BAIL

1. PUSH LEVER RESET BAIL CAM
2. PUSH LEVER RESET BAIL
3. PUSH LEVERS UP
4. PUSH LEVERS REAR

POSITIONING THE CODE BAR SHIFT BARS

1. SELECTOR ARMATURE
2. SPACING LOCK LEVER
3. MARKING LOCK LEVER
4. SPACING/MARKING LOCK LEVER CAM
5. SELECTOR LEVE CAM
6. SELECTOR LEVERS
7. PUSH LEVERS
8. INTERMEDIATE ARMS
9. TRANSFER LEVER SPRINGS
10. TRANSFER LEVERS
11. CODE BAR SHIFT BARS

POSITIONING THE CODE BARS

1. CODE BAR CLUTCH TRIP CAM
2. CODE BAR CLUTCH TRIP SHAFT LEVER
3. CODE BAR CLUTCH TRIP SHAFT
4. CODE BAR CLUTCH TRIP LEVER
5. CODE BAR CLUTCH ASSY
6. CODE BAR CLUTCH ECCENTRIC
7. CODE BAR CLUTCH ECCENTRIC FOLLOWER ARM
8. SHIFT LEVER DRIVE SHAFT EXTENSION
9. SHIFT LEVER DRIVE SHAFT
10. SHIFT LEVER DRIVE ARM
11. SHIFT LEVER LINK
12. CODE BAR SHIFT LEVERS
13. CODE BAR SHIFT BARS
14. CODE BARS

RELEASING THE FUNCTION AND TYPE BOX CLUTCHES

1. CODE BAR CLUTCH CAM
2. CODE BAR CLUTCH CAM FOLLOWER ARM AND ROLLER
3. CLUTCH TRIP LEVER SHAFT
4. FUNCTION CLUTCH TRIP LEVER
5. FUNCTION CLUTCH SHOE LEVER
6. TYPE BOX CLUTCH TRIP ARM
7. TYPE BOX CLUTCH TRIP LEVER
8. TYPE BOX CLUTCH SHOE LEVER

VERTICAL POSITIONING

1. TYPE BOX CLUTCH
2. TYPE BOX CLUTCH DRIVE LINK
3. MAIN ROCKER SHAFT DRIVE BRACKET
4. MAIN ROCKER SHAFT
5. MAIN ROCKER SHAFT BRACKET
6. MAIN SIDE LEVER DRIVE LINKS
7. MAIN SIDE LEVERS
8. VERTICAL POSITIONING LEVERS
9. TYPE BOX CARRIAGE TRACK
10. TYPE BOX CARRIAGE
11. TYPE BOX

HORIZONTAL POSITIONING

INITIAL POSITIONING

1. #3 CODE BAR PROJECTION
2. REVERSING SLIDE SHIFT LEVER
3. HORIZONTAL MOTION REVERSING SLIDE
4. RIGHT AND LEFT REVERSING SLIDE BRACKETS
5. RIGHT AND LEFT SHIFT SLIDE DRIVE LINKS

FINAL POSITIONING

1. TBC
2. TBC DRIVE LINK
3. MAIN ROCKER SHAFT DRIVE BRACKET
4. MAIN ROCKER SHAFT
5. MAIN BAIL DRIVE BRACKET
6. MAIN BAIL LINKS
7. MAIN BAIL
8. SHIFT SLIDE DRIVE LINKS
9. OSCILLATING RAIL SHIFT SLIDE
10. HORIZONTAL MOTION STOP SLIDES
11. OSCILLATING RAIL SHIFT LINKS
12. OSCILLATING RAIL
13. OSCILLATING RAIL SLIDE
14. TYPE BOX CARRAIGE LINK
15. TYPE BOX CARRAIGE
16. TYPE BOX

PRINTING A CHARACTER AND RESETTING

1. TYPE BOX CLUTCH
2. TYPE BOX CLUTCH DRIVE LINK
3. MAIN ROCKER SHAFT DRIVE BRACKET
4. MAIN ROCKER SHAFT
5. MAIN BAIL DRIVE BRACKET
6. MAIN BAIL LINKS
7. MAIN BAIL
8. PRINTING TRACK
9. PRINTING ARM
10. PRINTING HAMMER OPERATING BAIL LATCH
11. PRINTING HAMMER OPERATING BAIL
12. PRINTING HAMMER OPERATING BAIL STOP
13. PRINTING HAMMER BAIL
14. PRINTING HAMMER
15. TYPE PALLETS

RESETTING

16. MAIN BAIL
17. PRINTING TRACK
18. SECONDARY PRINTING ARM
19. PRINTING HAMMER OPERATING BAIL
20. PRINTING HAMMER OPERATING BAIL LATCH

SPACING (CARRAIGE ADVANCE)

INITIAL MOVEMENT

1. TBC
2. TBC DRIVE LINK
3. MAIN ROCKER SHAFT DRIVE BRACKET
4. MAIN ROCKER SHAFT
5. MAIN ROCKER SHAFT CAM PLATE
6. SPACING TRIP LEVER BAIL
7. SPACING TRIP LEVER

FINAL MOVEMENT

8. MAIN ROCKER SHAFT CAM PLATE
9. SPACING TRIP LEVER BAIL
10. SPACING TRIP LEVER
11. SPACING CLUTCH TRIP ARM
12. SPACING CLUTCH TRIP LEVER
13. SPACING CLUTCH SHOE LEVER
14. SPACING CLUTCH ASSY
15. SPACING CLUTCH RESTORING CAM
16. SPACING TRIP LEVER
17. SPACING SHAFT HELICAL DRIVING GEAR
18. SPACING SHAFT HELICAL DRIVEN GEAR
19. SPACING SHAFT
20. SPACING ECCENTRICS
21. SPACING DRUM FEED PAWLS
22. SPACING DRUM
23. DRAW WIRE ROPES
24. PRINTING CARRAIGE
25. OSCILLATING RAIL SLIDE

FUNCTION SELECT

1. FUNCTION CAM
2. FUNCTION CAM FOLLOWER ARM AND ROLLER
3. FUNCTION ROCKER SHAFT
4. FUNCTION BAR RESET BAIL
5. FUNCTION BAR RESET BAIL BLADE
6. FUNCTION BAR
7. FUNCTION PAWL
8. FUNCTION CAM
9. FUNCTION CAM FOLLOWER ARM AND ROLLER
10. FUNCTION ROCKER SHAFT
11. FUNCTION BAR RESET BAIL
12. FUNCTION BAR RESET BAIL BLADE
13. FUNCTION BAR
14. FUNCTION PAWL
15. FUNCTION LEVER

STRIPPING OF FUNCTIONS

1. FUNCTION CLUTCH ECCENTRIC
2. ECCENTRIC FOLLOWER
3. DRIVING LINK
4. DRIVING ARM
5. STRIPPER SHAFT
6. DRIVING CAMS
7. CAN ARMS
8. STRIPPER BLADE
9. FUNCTION PAWL

OPERATION OF RIBBON FEED

1. TBC
2. TBC DRIVE LINK
3. MAIN ROCKER SHAFT DRIVE BRACKET
4. MAIN ROCKER SHAFT
5. MAIN ROCKER SHAFT BRACKET
6. MAIN SIDE LEVERS
7. RIBBON DRIVE LINKS
8. RIBBON SPOOL BRACKET
9. RATCHET FEED LEVER
10. RATCHET DETENT LEVER
11. RATCHET WHEEL
12. RATCHET WHEEL FRICTION SPRING
13. RIBBON TENSION PLATE
14. RIBBON TENSION SPRING
15. RIBBON TENSION BRACKET
16. RIBBON SPOOL SHAFT
17. RIBBON SPOOL

RIBBON REVERSE

1. RIBBON EYELET
2. RIBBON LEVER
3. RIBBON REVERSING LEVER
4. RIBBON FEED REVERSE LEVER
5. RIBBON REVERSE SPUR GEAR
6. RIBBON REVERSE SHAFT
7. TOGGLE LINK
8. RIBBON REVERSE DETENT LEVER

NORMAL (DOUBLE) LINE FEED

1. LF FUNCTION LEVER
2. LF SLIDE ARM
3. LF CLUTCH TRIP ARM
4. LF CLUTCH TRIP LEVER
5. LF CLUTCH SHOE LEVER
6. LF CLUTCH ASSY
7. LF CLUTCH SPUR GEAR
8. LF ECCENTRIC SPUR GEAR
9. LF ECCENTRICS
10. LF BARS
11. LF BAR BELL CRANK
12. LF SPUR GEAR
13. PLATEN

SINGLE LINE FEED

1. LF CLUTCH CAM DISK
2. STRIPPER BAIL
3. STRIPPER BAIL ARM
4. LF FUNCTION PAWL STRIPPER
5. LF FUNCTION PAWL

SPACING SUPPRESSION

1. FUNCTION CAM
2. FUNCTION CAM FOLLOWER ARM AND ROLLER
3. FUNCTION ROCKER SHAFT
4. FUNCTION BAR RESET BAIL
5. FUNCTION BAR RESET BAIL BLADE
6. FUNCTION BAR
7. FUNCTION PAWL
8. FUNCTION LEVER
9. SPACING SUPPRESSION BAIL
10. SPACING SUPPRESSION SLIDE
11. SPACING TRIP LEVER

SPACING SUPPRESSION ON SINGLE LINE FEED

12. SPACING SUPPRESSION ON SINGLE LF FUNCTION LEVER (#34)
13. SPACING SUPPRESSION BAIL
14. SPACING SUPPRESSION SLIDE
15. SPACING TRIP LEVER

LOCAL LINE FEED

1. LOCAL LF KEY AND KEYLEVER
2. LOCAL LF FUNCTION LEVER
3. LOCAL LF BAIL
4. LOCAL LF TRIP LINK
5. LF CLUTCH TRIP LEVER

LOCAL CARRAIGE RETURN

1. LOCAL CR KEY AND KEYLEVER
2. LOCAL CR BAIL
3. LOCAL CR TRIP LINK
4. CR LEVER
5. SPACING DRUM FEED PAWL RELEASE LINKS

NORMAL CARRIAGE RETURN

1. FUNCTION CAM
2. FUNCTION CAM FOLLOWER ARM AND ROLLER
3. FUNCTION ROCKER SHAFT
4. FUNCTION BAR RESET BAIL
5. FUNCTION BAR RESET BAIL BLADE
6. CR FUNCTION BAR
7. CR FUNCTION PAWL
8. CR FUNCTION LEVER
9. CR SLIDE ARM
10. CR BAIL
11. CR LEVER
12. CR LATCH BAIL
13. SPACING DRUM FEED PAWL RELEASE LINKS
14. SPACING DRUM FEED PAWLS
15. SPACING DRUM
16. DRAW WIRE ROPE
17. PRINTING AND TYPE BOX CARRIAGE
18. CR SPRING DRUM
19. SPACING DRUM STOP RING EXTENSION
20. CR LATCH BAIL PLATE
21. CR LATCH BAIL
22. STOP ARM
23. STOP ARM ROLLER
24. TRANSFER SLIDE
25. DASHPOT PISTON
26. DASHPOT

AUTOMATIC CR & LF

1. SPACING SHAFT HELICAL DRIVING GEAR
2. SPACING SHAFT HELICAL DRIVEN GEAR
3. SPACING DRUM FEED PAWLS
4. SPACING DRUM
5. ACR RING PROJECTION
6. ACR & ALF BELL CRANK
7. "0" CODE BAR
8. ACR FUNCTION BAR (#4)
9. ACR FUNCTION PAWL
10. ACR FUNCTION LEVER
11. CR SLIDE ARM
12. ALF FUNCTION BAR (#38)
13. ALF FUNCTION PAWL
14. ALF FUNCTION LEVER
15. LF SLIDE ARM

LETTERS SHIFT

1. FUNCTION CAM
2. FUNCTION CAM FOLLOWER ARM AND ROLLER
3. FUNCTION ROCKER SHAFT
4. FUNCTION BAR RESET BAIL
5. FUNCTION BAR RESET BAIL BLADE
6. LTRS FUNCTION BAR
7. LTRS FUNCTION PAWL
8. LTRS FUNCTION LEVER
9. LTRS FUNCTION SLIDE
10. LTRS/FIGS CODE BAR FORK
11. LTRS/FIGS CODE BAR BRACKET
12. LTRS/FIGS CODE BAR ("S" CODE BAR)
13. LTRS/FIGS SHIFT SLIDE
14. RIGHT SHIFT LINK BREAKER SLIDE
15. LEFT SHIFT LINK BREAKER SLIDE
16. TYPE BOX CLUTCH
17. TYPE BOX CLUTCH DRIVE LINK
18. MAIN ROCKER SHAFT DRIVE BRACKET
19. MAIN ROCKER SHAFT
20. MAIN BAIL DRIVE BRACKET
21. MAIN BAIL DRIVE LINKS
22. MAIN BAIL
23. RIGHT/LEFT BREAKER SLIDE BAILS
24. SHIFT LINK BREAKER SLIDES
25. OSCILLATING RAIL SHIFT LINKS
26. OSCILLATING RAIL
27. OSCILLATING RAIL SLIDE
28. TYPE BOX CARRAIGE LINK
29. TYPE BOX CARRAIGE
30. TYPE BOX

LINE FEED ON CARRIAGE RETURN

1. LINE FEED ON CARRIAGE RETURN FUNCTION BAR, PAWL, LEVER, AND SPRINGS (SLOT 39)
2. LINE FEED ON CARRIAGE RETURN BLOCKING FUNCTION BAR, PAWL, LEVER AND SPRINGS (SLOT 14)
3. LINE FEED ON CARRIAGE RETURN BLOCKING FUNCTION LEVER LATCH.
4. LINE FEED ON CARRIAGE RETURN BLOCKING FUNCTION SLIDE.
5. SHIFT PLATE ROLLER.
6. SHIFT PLATE
7. SHIFT PLATE POST AND SPRINGS.
8. BLOCKING SLIDE AND SPRING.
9. UNIVERSAL #1 FUNCTION BAR, PAWL, LEVER AND SPRINGS. (SLOT 12)
10. UNIVERSAL #2 FUNCTION BAR, PAWL, LEVER AND SPRINGS. (SLOT 13)
11. FUNCTION LEVER LATCHES IN SLOT 12 AND 13.