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TELETYPEWRITERS MADE EASY!

A Manual on Teleprinters Commonly
Used in the Telephone Network for the Deaf

Compiled by a staff of
teletypewriter devotees who, themselves,
are very much a part of the deaf network.

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Teletypewriters for the Deaf, Inc.
Indianapolis, Indiana
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THE WORKSHOP GANG

From left to right: Dan Skinner, Tom Schwarz, Gene McDowell, Paul Taylor, Fred Stewart, Bob Weitbrecht, and Tom Rule.

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To those dedicated servicemen who have devoted thousands of hours acquiring, transporting, rebuilding and rewiring ancient machines encrusted with grease and filth, and replete with broken, damaged, and worn parts; men who have hauled hundreds of pounds of equipment up and down rickety stairs and through dark passages to deliver these precious teletypewriters to their deaf recipients who never knew any other form of telephonic communications.

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PREFACE

The preparation of these manuals was admittedly a crash program instituted to fulfill a pressing need. Perfection and completeness in the first printing was not expected. This is why the printing was done on standard loose leaf notebook paper... to facilitate corrections, revisions, and additions as feedback from field use dictates. An open forum will be maintained, with addendums issued in order of their pertinence or demand.

Paul L. Taylor

Frederick N. Stewart

FOREWORD

The teletypewriter (TTY) system with which deaf people communicate over the regular telephone lines with each other, with hearing relatives, and with organizations serving them, has been largely based on old equipment which has been discarded by the telecommunications industry as not worth repairing. One consequence of using such old machines is that the service manuals which provide instruction in reconditioning and maintaining the equipment are not easily decipherable by the layman.

Requests have been received from time to time by Teletypewriters for the Deaf, Inc. (TDI) for such service manuals, but unfortunately we have been unable to do more than provide a referral to individuals who possess such manuals and who are willing to photocopy them. Such a solution has not proven to be very satisfactory for one reason or another. The complexity of the manuals and the technical language therein tends to limit their usefulness to most deaf people who might be interested in reconditioning and maintenance.

TDI is pleased to present herewith a set of service manuals designed specifically for deaf people. They cover the basic types of equipment used by most stations in the system. Such equipment consists of the Model 15, the Model 28 KSR, and the new Model 32 KSR. A section is devoted to each model; there are three sections altogether in the manual. No attempt has been made to include other types of equipment such as the Western Union 100 series, the Kleinschmidt, the Mite, and the Model 26 since they are relatively scarce in the deaf network. The Lorenz machines

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are basically an adaption of the Model 15.

This manual is designed and written not only for the serviceman, but also for those individuals who are interested in simple maintenance of their own equipment. To make it as useful as possible to the largest audience, the pictorial or illustrative approach has been emphasized with technical language reduced to a minimum.

The preparation of this service manual was carried out during a seven-day workshop in St. Louis, Missouri the week of May 5-11, 1974. Organized by Paul L. Taylor, Vice-President of TDI, the workshop brought together a group of men possessing expertise and experience in the various types of equipment. This group included Eugene McDowell, Thomas Schwarz, Dan Skinner, J. Thomas Rule, and Robert Weitbrecht. The photography was done by Tommy Joe Markham. Fred Stewart assisted Paul Taylor in the editing and overall supervision of the workshop. The typing was done by Sally Taylor and Peggy McLaughlin. The members of TDI, as well as other individuals, are grateful to them for their contributions.

The workshop and the publication of the service manuals were made possible through a loan from TDI which drew upon a revolving fund established by a grant made by the Lilly Endowment, Inc. in 1973. The repayment of the loan is expected to come from sales of the manuals to interested parties.

TDI hopes that all users of the service manuals will find them useful and that a need has been fulfilled. Comments from readers are most welcome.

H. Latham Breunig, President
TELETYPEWRITERS FOR THE DEAF, INC.

INTRODUCTION

The Model 15 Teletype machine was manufactured by Teletype Corporation of Chicago, Illinois, during the years between the late twenties and the early fifties. It is a reliable heavy duty teletypewriter, in use for years by news agencies, Bell System's Teletypewriter Exchange (TWX), Western Union Telegraph Company, the railroads, and the armed services - especially during WW II. Hundreds of thousands of such M15 units have been produced.

The Model 28 Teletype machine, manufactured since the 1950's, and still in production (also part of Model 35), is a modern version of the earlier machines. It is fitted with a versatile "stunt box"--which permits control of outside accessories such as reperforators, call sequencers, even a coffee pot, or anything--upon receipt of certain signals placed thereto. Hundreds of thousands of such Model 28's exist.

The Model 32 Teletype machine is a low-cost, light-duty type, made with many plastic parts. It is fairly reliable, and should serve well for years on a 60-wpm network such as TDI has. A similar machine, called the Model 33, is in wide use by computer users, and parts are quite interchangeable.

This Manual concerns only the above three types. There are other types, perfectly compatible, communications-wise with all these types. Such include the Model 14 Teletype tape printers, the Model 19 Composite Set (Automatic Send and Receive = ASR), the Model 26 Teletype page printer, the Kleinschmidt 100, the Western Union 100-series, the MITE Corp. teleprinter, the Creed,

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the Lorenz, the Siemens, and the Olivetti. Thus, many makes of machines are to be found in use in the TDI network. However, Model 15 and 28 Teletype machines continue to be widely available, with possible future availability of quantities of Model 32 units.

The Baudot Code was originated by Emile Baudot, a French telegraph engineer, some 100 years ago. It is a 5-level code, with $2^5 = 32$ different combinations available. The modern 5-level code is somewhat different in character assignments from the original Baudot. Murray devised the present code, with start and stop elements added to permit what is called "start-stop telegraphy"--a distinct advance over the original Baudot which required a multiplex scheme. Hence, some engineers call this code a "seven element code". Actually, the code contains five intelligence elements. Hence the term 5-level. It is one of the simplest and most efficient signaling codes known, and universally used to recent times by teleprinter manufacturers around the world. No wonder there are so many different makes of machines, all compatible to each other when geared to the same speed, 60 wpm nominal, 45.45 Baud, as employed in our TDI network.

Monsieur Emile Baudot would be proud to know that his machines are making thousands of deaf people happy, in being able to telecommunicate with each other. Indeed, we are grateful to all the makers of equipment, such as the Teletype Corporation, in particular, for generous contributions to the welfare of Teletypewriters for the Deaf, Inc. and its network.

GENERAL

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COMMENTS ON PREPARING A TELETYPEWRITER MACHINE FOR USE WITH AN ACOUSTICAL COUPLER

Used teletypewriter machines come in a variety of conditions. Some (such as those from Western Union) may be immediately usable upon receipt. Bell System machines usually require rewiring, along with installation of new power and signal plugs and cords. Machines may come with tables or consoles, or without either. For our purposes, it is well to recondition each machine so that it will render satisfactory service for a long period of time. In this way, each teletypewriter owner is assured of the best possible setup for his needs.

Each machine will have three cords and plugs, all of suitable length to easily reach an acoustical coupler unit placed near a telephone. A suggested length is 8 feet. In this way, the cords can be cabled together and placed out of the way.

Two of the cords look alike, ending in red and black phone plugs; the red indicated MAGNET LINE while the black indicates KEYBOARD LINE. The third cord ends in a safety 115 VAC plug usually having an U-shaped grounding pin for eliminating shock hazards.

Specific instructions are given in the various sections referring to Models 15, 28, and 32 teletypewriters.

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PROCEDURE FOR GENERAL CHECKOUT OF A TELETYPEWRITER STATION

1. Dial the telephone number of a news station known to have an accurate (zero bias) signal.
2. With the news coming in, take range finder measurements. Move the range finder lever towards lower numbers, and watch the printing. When it starts to garble, move the lever up slightly - try to find a setting at which printing is just barely garbling. Read the number. It may be 21, for example. Now do this on the other end of the range finder - higher number. It may be 105, for example. The machine is found to have a range span of 105 - 21 = 84 points.
3. With the news shut off, the keyboard can now be checked. Send various words like THE QUICK BROWN FOX....., and you find a low number and a high number at which your TTY starts to misprint. Read the numbers. They might be 25 and 98; thus the keyboard has some distortion; 98 - 25 = 77 points.
4. In general, if a given installation has a range span of 70 points or better, it is in good adjustment. Note that this is an overall check on both typing unit and keyboard systems.
5. FINALLY, when all range measurements are completed, center the range finder of your machine, thus halfway between 105 and 21. An easy way to find the center is to add 105 and 21, then divide by 2, thus 126/2 = 63. The range finder lever is moved to 63 and clamped there.

ADJUSTING THE RANGE FINDER

The range finder usually looks something like a drawing compass with a pointer clamped to the semi-circle with a knurled screw.

With the cover removed, turn your TTY on and loosen the knurled screw on the range finder pointer.

While hitting RYRYRYRYRY....repeatedly, slowly move the pointer in one direction until the printing <u>just</u> begins to garble. Stop and note the number on the semi-circle.

Now again, hit RYRYRYRYRY...repeatedly and slowly move the pointer in the opposite direction until the printing <u>just</u> begins to garble again. Note the new pointer position number.

If the difference between the two numbers is less than 40, check lubrication, magnet adjustment, contact spacing and cleanliness, and look for slipping clutches, worn bearings on the mainshaft, improper gear meshing (binding or backlash), etc.

After remedying any indicated service needs, finally clamp the range finder midway between the two positions where garbling starts.

COMMENTS ON MAINTENANCE AND TROUBLESHOOTING

After the teletypewriter has seen some service, it may sooner or later require some attention. The best advice concerning preventive maintenance is to leave the machine alone as long as it is giving satisfactory service. An exception is the annual oiling of the machine, but even that ritual is not absolutely mandatory, mainly due to the low number of hours the machine is in service among the deaf in comparison to its normally high usage in the communications industry.

If your machine looks dry, it probably needs oiling. From experience, the best oiling procedure is to apply a drop or two of oil and no more wherever moving parts slide over one another, especially rotating parts. Excessive oil can absorb dirt and become gummy. Locations of oiling places are easily observable by typing with the cover removed. Particularly, the gears, bearings, oil cups, and felt cloth washers (in clutches) should be oiled.

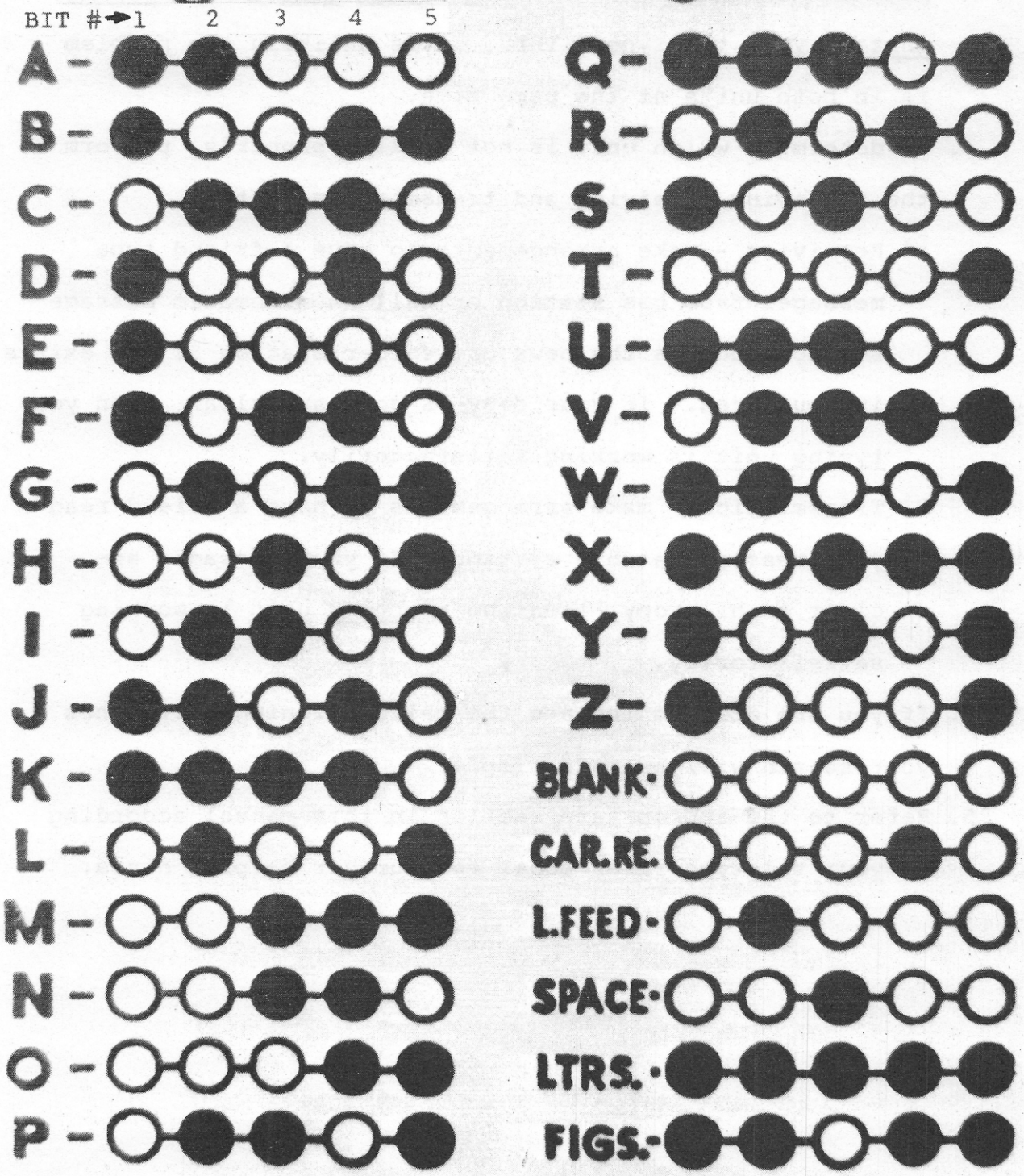
When your machine does not work properly, the first thing to do is to keep calm about it. Try to be methodical in your attempts to locate the trouble. Keep in mind that your communication station not only involves your teletypewriter but also the acoustical coupler and the telephone. It is very possible that your teletypewriter is perfectly all right and that the problem exists elsewhere.

Below is a suggested order of troubleshooting sequence to isolate your problem:

1. Check your acoustical coupler. If you are not sure, borrow one from a friend.
2. If the above step does not remedy your problem, then the problem exists either in the keyboard unit or the typing unit of your teletypewriter. It is unlikely the problem is in both units at the same time.
3. To determine which unit is not working properly, perform the following receiving and transmission tests:
   a) Receiving - make arrangements to have a friend type messages from his station or call an automatic message station such as the news or weather station if one exists in your area. If your copy is good and clear, then your typing unit is working satisfactorily.
   b) Transmission - make arrangements to have a friend read your messages at his station. If your messages are clear on his copy, then the keyboard unit is working satisfactorily.
4. If you are able to isolate the malfunctioning unit, then your search will be made simpler.
5. Refer to the appropriate section in this manual according to your teletypewriter model for further helpful hints.

BAUDOT CODE

○ SPACE ● MARK



REFERENCES

There are at least three books, of main interest to amateur radio teletypewriter operators; however, they contain much useful information relating to Teletype machines. The first two books listed below are of more interest to those having Models 15, 28, and 32 units; the third book, from Radio Society of Great Britain, cater more to Creed machines, with a rather sketchy description on the Teletype Model 15. It is a fabulous book for those wishing to explore more thoroughly the theory behind radio teletypewriter operations.

1. RTTY FROM A TO Z, by Durward Tucker
   Cowan Publishing Corp.
   14 Vanderventer Ave. $5.00
   Port Washington, N. Y.

2. The New RTTY Handbook, by Byron Kretzman
   Cowan Publishing Corp.
   14 Vanderventer Ave.
   Port Washington, N. Y. $3.95

3. The Teleprinter Handbook (RSGB Publication)
   Ham Radio Books
   Greenville, New Hampshire 03048 $14.95

Some information relating to hardware as used in the Teletypewriters for the Deaf network may be found in the "Green Book":

First National Conference of Agents of
Teletypewriters for the Deaf, Inc.
November 13-14, 1971
Gallaudet College, Washington, DC.

Obtainable through various TDI agents or
from Teletypewriters for the Deaf, Inc.
P. O. Box 622, Indianapolis, Ind. 46206.

TELETYPE CORPORATION BULLETINS

There are many bulletins, some old, some new, on the Teletype Corporation Models 15, 28, and 32. Some may be found through friends connected with the Telephone Company or with Western Union. Others may be procured through some of the suppliers, such as BVE Enterprises.

Bulletin 138B	Adjustments Model 15
Bulletin 216B	Description and Principles Model 28
Bulletin 217B	Adjustments and Lubrication Model 28
Bulletin 273B	Vols. 1 and 2: Technical Manual Model 32 and 33
Bulletin 1037B	Parts Catalog Model 15
Bulletin 1149B	Parts Model 28
Bulletin 1164B	Keytops and Pallets
Bulletin 1184B	Parts Model 32 and 33
Bulletin 1210B	Parts Model 32

SUPPLIERS

These dealers handle surplus teletypewriter equipment, parts, and other related items. Other makes of TTYs, such as Lorenz, Kleinschmidt, and Siemens, may be found at such places, as well as Teletype Corp. equipment. This is only a short list; undoubtedly, there are other surplus dealers, out West, who handle such items.

Andy Electronics
6319 Long Drive
Houston, Texas 77017

BVE Enterprises
Box 73
Paramus, N. J. 07052

Typetronics
P. O. Box 8873
Fort Lauderdale, Fla. 33310

Van's W2DLT Electronics
302 Passaic Avenue
Stirling, N. J. 07980