

# Modifying the Model 28 Teletype

## PART 4 - The STUNT BOX

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### THE STUNT BOX

This is possibly the section that a great many of you have been waiting for. There is so much to cover, however, that we shall have to do it in bits and pieces.

If you have wondered why this unit is called the "stunt box" you will better understand after we have shown you how to remove it. Since this mechanical marvel enables the operator to accomplish a great variety of features (or "stunts") it became known as the "stunt box". An excellent booklet going into elementary detail of the stunt box was available for free from the Teletype Corporation until recently, but unfortunately they no longer print the booklet. We shall therefore, have to try to describe the action of the various parts through a few simple photographs. The 216B manual on "Description and Principles of Operation" has some modest but information drawings of the stunt box in Section 573-115-100 on pages 33-37.

It would probably be easier to discuss the stunt box and components in it if we were to first have a look at it.

### REMOVING THE STUNT BOX

The stunt box is located at the rear of the typing unit, directly below where the roll of paper sits. Fig. 7 shows the unit removed, just as it would be pulled out of the machine, with the rear part facing you, as well as the rear of the typing unit. Fig. 8 is approximately the same thing, but with the stunt box swung around to show the "business end" that plugs into the typing unit. Fig. 9 probably is a poor photograph, but shows the stunt box in my particular 28ASR, which is "loaded" and has all 42 slots being used for various purposes. This is getting ahead of the story, but figs. 8 and 9 show the two extremes between a "minimum loading" and a "full house" loading.

Now to get on with taking it out of the machine as shown in Figs. 7 and 8. First, remove the typing unit from the keyboard base. We have discussed this before, if you need a review, see Article 3 where we were talking about the keylevers -- under

that section we discussed removing the typing unit.

Set the typing unit on a piece of newspaper, then turn it around so the rear faces you. Remove the paper roll if you have not already done so. About the bottom of where the paper had been, you will see (on most of the machines, probably all of them) a six-sided rod about the size of a wooden pencil that runs between the left and right frame members (that supported the paper roll.) There is a bolt on each end holding this rod to those frame members. Get a small bowl or box to put these parts in, otherwise you'll surely knock them on the floor sooner-or-later and perhaps lose them. Remove the bolt at either end of that rod, then pull the rod out and lay aside.

Now looking slightly ahead of where this rod was, we see another one, only this one is round and smaller in diameter -- about an inch ahead of the one we just removed. This rod is part of the stunt box (operates the "stripper blade") and will not be removed, but there are some things attached to it which have to be disconnected. At the left end of this rod, about one and three-quarters inches from the left frame, there is a connection to this rod that goes to the main shaft below and operates the rod as the motor turns the gears. There is a bolt and retaining ring ("C" ring) that holds this piece to the shift. Remove the ring and the bolt. Now the rod is free from the coupling, which may be pushed to one side to disengage it from the arm that goes to the main shaft -- this arm then will drop down out of the way (depending upon whether the main shaft below has been rotated far enough).

Directly ahead of this rod we have been working on is the "stripper blade". It looks a little like a household "ruler" that you use to measure lengths up to one foot width. About one-half inch from the right side you will see a piece that has been added to the stripper blade. This "strips off" the pawl on the line feed slot. Look at the bottom of that added piece and you will see a hook that engages a small lever that projects through the hook. Keep this in mind, as this hook can get caught when trying to remove the stunt box (or replace it) unless

you first lift up with respect to the stripper blade; also when replacing the stunt box it is imperative that it re-engage the lever again.

Now just below the stripper blade at each end you will see two bolts. At each end, one of the two will be lower and farther away from the center of the machine than the other. It is this "lower" bolt at each end that holds the stunt box in the machine. Remove this "lower" bolt from each side, and now the stunt box is ready to be pulled out. Before you do so, note that the electrical wiring along the top of the stunt box is held from getting in the road of the paper by a small metal arm along the left frame member. Loosen that arm, swing it down a bit, free the electrical wires, and then put the arm back where it was. Now pull the stunt box out. When you have removed the two "lower" bolts, usually the stunt box "pops out" about a quarter-inch from the spring tension on the function bars. If it has not already "popped free", tug a little at either end of the rod ahead of the stripper blade, or rotate the main shaft below a revolution.

You can now slide the stunt box out, noting that it has grooves at either end to assist in this. At the right end, make sure that little "added piece" on the stripper blade is high enough to clear the bracket where you removed that "lower" bolt, otherwise you will be unable to pull it out any further. You will also perhaps need to rotate the main shaft somewhat so that the arm that hooked to the rod clears the bottom of the stunt box.

Although this has been quite detailed in an unscientific manner, you will appreciate these hints for the first attempt. After that of course, it immediately becomes a very simple job. Those reading this information who have already removed the stunt box a few times will find this section to be of elementary interest. But when working with a machine whose new cost was around \$1,200, a person finds even the most simple detail of great interest.

The end of the stunt box that has the electrical wires connected is the "beginning" end, and the slots are numbered starting at this end.

### TYPICAL SLOTS

The "repaired" mouse machines should all have a common stunt box arrangement. I think the non-repaired will all be identical except for a "Z" instead of an "H" on the motor-stop set-up as discussed in article 3.

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- Slot 1 - "Space"
- Slot 2 - "Figures"
- Slot 3 - "Letters"
- Slot 5 - "Carriage Return"
- Slot 22 - "Blank"
- Slot 28 - "Blank", upper-case"
- Slot 29 - "H, upper-case"
- Slot 30 - "S, upper-case print-only"
- Slot 35 - "Blank"
- Slot 36 - "Blank"
- Slot 38 - "Line Feed"
- Slot 40 - "Line Feed, print-only"

Now to explain. Slot 1 (space) is the "downshift-on-space" system. When a space is typed, it will pull a "shift-fork" on the top part of the stunt box which in turn operates the bottom code bar and puts you back into lower-case, if you were in upper-case. All the Mouse machines have this feature. About the middle of the top part of the stunt box at slot one is a bolt and locking nut. If this bolt is run "down" into the top of the stunt box, it causes the front of the function pawl in slot 1 to tilt down, causing the rear part to raise (Front in this case being toward the "business end" of the stunt box, rear being toward the stripper blade and rod.) If the function pawl is raised, it disables the "downshift-on-space" feature. Under rare circumstances you may want to disable this feature, as for copying certain commercial stations, but in general it is a most valuable feature and you would want to run the bolt out to where it does not interfere with the operation of the function pawl.

Slot 2 operates a slide on the top which pulls the shift fork the other way, causing the bottom code bar to go to "upper-case" and slot 2 also suppresses spacing during operation of "Figures" characters. Slot 3 pulls the same lever that slot 1 can operate, and moves the shift fork to "lower-case". Slot 3 also suppresses spacing.

Slot 5 operates a slide on the main frame of the typing unit just below the stunt box, which mechanically trips the carriage return mechanism. It also suppresses spacing.

Slot 22 has only one purpose, it suppresses spacing on "blank" characters, or during "open loop" configuration as when holding the "break key" down.

Slot 28 and 29 work together. If you get an "upper-case blank" slot 28 works, and latches up for one slot, so if immediately followed by an "H" (or "2" on some machines) it will then complete the switch

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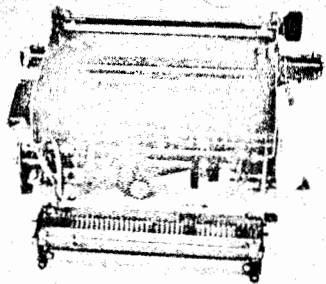


Fig. 7 Showing a stunt box as pulled out of the rear of the typing unit.

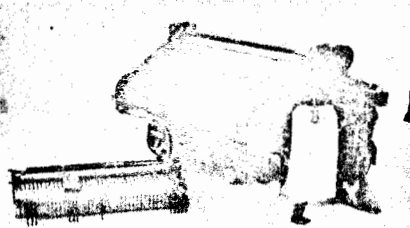


Fig. 8 Same stunt box showing the front side. The function bars are visible sticking out the front plate.

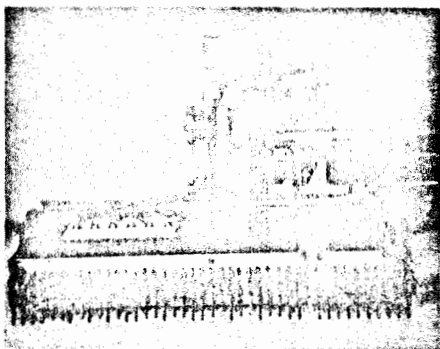


Fig. 9 A completely "loaded" stunt box using all 42 slots as used at W6FFC in the main 23ASR.

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above slot 29 and this will activate the "Motor-stop" relay. Slots 28 and 29 are called "sequential" since 29 cannot work unless 28 has been selected immediately prior.

Slot 30 is the "bell" and works from an "upper-case S". The bar is also coded for "print only" which has to do with selective call-up (Selcal) so the bell won't ring if you are in "non-print".

Slots 35 and 36 are also "sequential" so if you get two consecutive "blank"

character (or an open circuit) it will activate a slide on the main frame under the stunt box and mechanically lock the keyboard so you cannot type on it. This feature is of no particular value on radio circuits and may be disabled by tying up the function pawl on slot 35. This was discussed in Article 3, relative to the "motor stop" on slots 28 and 29. For simplification (in Article 3) we suggested tying up the function pawl "in the slot adjacent to the bell slot". That would be slot 29. However, now that you understand a "sequential pair" of slots, you will see it would actually give less wear and tear if you prevented the first slot from working rather than the slot that actually performs the function. We'll recommend you thus tie up slots 28 and 35 to prevent motor-stop and keyboard lock.

#### TYING UP FUNCTION PAWLS

This was discussed in Article 3 under "motor stop". We suggest if any of the pawls are now tied up (or if you are using an intentionally disabled downshift-on-space system in slot 1) you temporarily now put these slots back to normal. Here's the reason. When the function pawls are tied up, the function bars are free to slip out of the stunt box if it is tilted, and in any event the springs on the function bars will attempt to pull them out of the box. This makes it very awkward to replace the stunt box properly, even when you know what you are doing. By lowering the function pawls to normal position on such slots as 1, 28, 29, 35, and 36, then the function bars associated with those slots will be kept from slipping out of position, and returning the stunt box to the typing unit will be a simple job. Otherwise, even experts would have a most difficult problem without using special tricks of some sort. Those slots are easily enough tied back up to their "inactive" position once you get the stunt box back in the typing unit. This is a most important and useful hint, so do not overlook it! You will also find on many machines a small bracket on the top of the stunt box adjacent to slots 28 (may be partially hidden by the switch block) and 35. These little metal brackets are for the purpose of holding up the function pawl automatically. I suggest you do not use them, but instead just "tie up" the function pawl via a piece of string or small wire to the channel iron that holds the electrical wires. There are also special clips for the purpose which resemble bent paper clips.

#### THE REMAINING SLOTS

We had two slots to go before getting side-tracked about the sequential slots. Slot 38 has a "line feed" function bar in it whose only purpose is to suppress spacing for a line feed character. Slot 40 has a "line feed" function bar also, but responds only during "print". This is for "Sel-cal" action so that if in "non-print" you do not turn up a new line feed each time one is called for.

You will probably wonder why it is not possible to suppress spacing with slot 40 instead of having to add slot 38 for that purpose. It's a very interesting situation. Slot 40 actually operates the slide which trips off the line feed clutch. This is a "3-stop" clutch. That is, it COULD BE operated 3 times while the others are operated once. (The "spacing clutch" is also a 3-stop, all the others are "1-stop".

The reason the line feed clutch is a "3-stop" is to enable it to turn up two lines if desired rather than one. Many commercial installations such as radio stations, TV news departments, etc. prefer to double-space all incoming text automatically. The function pawl on the slot 40 is tripped off not by the main stripper blade but by the "added piece" we mentioned previously, so that it could be operated several times for double line-feeds. Anyway, to insure proper spacing suppression for line feed, we do it in "some other slot", namely slot 38 in this case.

#### REQUIRED SLOTS

Assuming you want to later add "auto CR-LF", we must use seven specific slots and 2-3 others of those remaining.

- Slot 1 - Space -- for downshift on space
- Slot 2 - Figures -- for upper-case
- Slot 3 - Letters -- for lower-case
- Slot 4 - Auto CR
- Slot 5 - Carriage Return
- Slot 39 - Auto LF
- Slot 40 - Line Feed
- Slot "A" Bell -- upper-case S
- Slot "B" Suppress spacing for line feed
- Slot "C" Suppress spacing for blank

Thus we have pretty much committed 10 of the 42 slots. This leaves 32 more that you can do all sorts of fancy things with, such as "Sel-cal", excess line feed prevention, excess bell-ringing prevention, automatic station control, remote control, automatic T.D. control, have it ring a bell in the house or shack if somebody mentions your name or call letters,

have it ring a bell if somebody unexpectedly sends "BK", and many other things which you may wish to do. Now let's show you how to install "non-overline" in your machine in a few seconds and at no expense.

#### ADDING NON-OVERLINE

On a "normal" Teletype machine, if someone accidentally hits the "Carriage Return" character, of course the carriage comes back, but will not turn up a new line. Thus it is easily possible to retype over the same material a second (or more!) times. This is called "over-lining", and of course is more than slightly annoying, as it not only wipes out what you have printed previously, but also destroys what is now being printed.

Fortunately the 28-series of Teletype equipment adapts immediately to "non-overline protection", and without use of new parts. The system requires almost no effort to incorporate and can be changed back in a few seconds to "factory stock" anytime the stunt box is removed from the typing unit.

In the case of the "mouse" machines, merely exchange the function bars in slots 5 and 33. That's absolutely all there is to it! The function bar is the item with the various "teeth" (tyes) that sticks out the front (business end) of the stunt box. To remove a function bar, unhook the spring on the bottom side of the stunt box, and merely pull the function bar out. It will probably catch on the hook of the function pawl at the rear of the stunt box, in this case, merely take your finger and hold up the function pawl for that particular slot and at the same time pull the function bar out.

If you are reading this series of articles and do not have a "Mouse" machine, it is simple enough to find the proper function bars. Prior to removing the stunt box, do this:

1. Remove the roll of paper
2. With the motor running peer at the top of the stunt box.
3. Hit the "carriage return" key -- some slot should show activity -- probably slot 5, starting your count at the right end of the stunt box as you look in while standing in front of the machine. Remember this slot number.
4. Now hit the "line feed" key. Two slots should show some activity. Slot 40 no doubt, and some other slot somewhere, probably (but not necessarily) slot 38.
5. Leave slot 40 alone, but exchange the

other two you found a place the stunt box.

#### WHY NON-OVERLINE WORKS

We have now placed a "linefeed" function bar in slot 5. This also suppresses spacing for line feed characters. We have now put the original "carriage return" function bar in the "other slot". Thus all it now does is suppress spacing for "carriage return" characters.

Thus when a "carriage return" character is typed or received, nothing at all happens, and the carriage really does not come back at all, like it once did. On the other hand, now when a "line feed" character is received or typed, this will return the carriage via slot 5 and turn up a new line via slot 40. Thus we have eliminated the possibility of an erroneous carriage return wiping out previous material via "over-lining", and now the machine acts more like a normal typewriter insofar as we get carriage return and line feed concurrently.

The 28 machine gets back so rapidly to the beginning of a line it is not necessary to type some "non-printing" character (such as a "letters") following the line feed, but it is still standard practice and always has been. Even at 100 speed, the unit should "get back in time" if properly adjusted. Perhaps normal "end-of-line" sequence should be reviewed as many people apparently are not aware of customary routine in this respect:

1. CR
2. CR
3. LF
4. LTRS

It may feel awkward for awhile to hit the "CR" key and have nothing at all happen, but the delightful improvement in copy will make it most worthwhile.

Before leaving the subject of non-overline, let me say that there are many other systems which you can use as well. It should be obvious that none of them could approach the simplicity of this system where you merely exchange two items in the stunt box that are easy to get at. The other systems require moderately elaborate slot components, some special parts, and rely completely for normal operation upon the reception of "CR" and "LF" in their proper sequence. Some of these systems are fascinating to install or decipher, but in general you would find them costly, inferior in performance to this ultra-simple system, and worst of all,

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they tie several slots you may need for other things. Later in the year we may mention some of them for their interesting application of stunt box potential.

#### REPLACING THE STUNT BOX

If you now have the "non-overline" feature added (or for some reason decided you didn't have any need for it) you are ready to replace the stunt box. We have not installed "auto CR-LF" parts as yet, we'll get into that a little later in the series as right now we are trying to give you the "feel" of the stunt box and don't want to rush things too fast.

Make sure none of the function pawls are tied up or held up via the little metal brackets we talked about. Peer under the stunt box and make certain all the springs are hooked properly to the function bars. Now note that on either side of the stunt box is a little guide to go in the "rails" to help put it back in the typing unit. There are only three things to particularly watch as you slide it back in.

- 1) The "arm" from the main shaft below might get in the way of the leading edge of the stunt box, so be careful to keep it out of the way.
- 2) As you get a little further in, make sure the hook on the bottom of the "added piece" of the stripper blade clears the bracket that holds the right side of the stunt box, and then as you get further in, make sure this hook engages its lever properly.
- 3) The "shift fork" at the top left of the stunt box (we are at the rear of the unit, and "left" corresponds with slot 1, etc.) must engage the shaft in the typing unit properly. You may take a screwdriver and tap the "U" slot in the shift fork so it will properly engage, if necessary.

When you get within a quarter-inch or so of all the way in, you will meet sudden resistance. This is normal, as the function bars are spring-loaded and resist this final short distance. If everything else appears normal, just give a quick push at each end of the stunt box and it should snap into place. It may be necessary to hold it there while you install the two "lower" bolts to hold it in place.

Then hook up the main shaft "arm" to the coupler on the rod at the rear of the stunt box and install the locking bolt and "C" retaining ring again. Put the electrical

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## Armed Forces Day - 1970

The annual Armed Forces Day Communication Tests will be held on May 16, 1970.

QSL cards for RTTY contacts may be obtained from any or all of the Armed Forces stations in operation.

QSLs will not be acknowledged from SWL stations but they may copy the official Message text and a certificate will be awarded for perfect copy as well as from licensed amateurs.

Military radio stations WAR, NSS, NPG and AIR will be on the air from 16/1400 GMT to 17/0245 GMT. During this test of crossband operations, the military stations will transmit on specified military frequencies while amateur stations will transmit in the indicated portions of the amateur bands. Contacts will consist of a brief exchange of locations and signal reports. No traffic handling will be permitted.

A radioteletypewriter "RTTY" receiving contest will be conducted for any individual amateur or station possessing the required equipment. The "RTTY"

TIME	S TRANSMITTING STATION	FREQUENCIES (KHZ)
16 May 1970	WAR - Army	3347, 6992.5, 14405
17/0335 GMT	NSS - Navy	4012.5, 7380, 13940
16/2335 EDST	NPG - Navy	4016.5, 7347.5, 13922.5
16/2035 PDST	AIR - Air Force	3397.5, 7315, 13995
	A6USA - Army Radio San Francisco	6997.5
	A5USA - Army Radio Fort Houston, Texas	4025

#### 28 Modifications -

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wires under the little metal arm to keep them out of the way of the paper roll. Reinstall the support bracket (the six-sided rod), put the printer unit back on the keyboard base, turn the motor by hand (CCW) 1-2 revolutions, replace the four bolts holding it to the base, reconnect the cable to the rear of the right ribbon spool and you should be back to normal after re-tying up the function pawls for keyboard lock (slot 35) and motor-stop (28 or 29). You will now have non-overline and have learned quite a bit about the stunt box in the process. Now you will be anxious to add auto CR-LF, and that will come soon.

Article 5 will give a basic discussion of the stunt box components and how different items can do some of the things we have already mentioned.

18 MAY 1970

broadcast will consist of a special Armed Forces Day message from the Secretary of Defense to all radioteletypewriter enthusiasts.

#### SUBMISSION OF COMPETITION ENTRIES

Transcriptions should be submitted "as received". No attempt should be made to correct possible transmission errors.

Time, frequency and call sign of the station copied as well as the name, call sign (if any) and address of the individual submitting the entry must be indicated on the page containing the text. Each year a large number of perfect copies are received with insufficient information, thereby precluding the issuance of a certificate.

Completed entries should be submitted to the Armed Forces Day Contest, ATTN: AF0CCOM, Room 3E099, James Forrestal Building, 1000 Independence Avenue, Washington, D.C., 20330, and postmarked no later than 31 May 1970.



Ester XYL & Laura XYL & Grovie K9SLQ  
Denny WA8BVY 'Len' VE5LG & XYJ Susan

Signal One-on RTTY - Next Month-  
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