Equipping the Model 28 Stunt Box

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Perhaps the most unique and important feature of the Model 28 series of teletype equipment is the stunt box. This is the device that permits the machine to perform or respond to mechanical and electrical signals and further control external equipment. Several references that pertain to the stunt box are as follows:

a. TTY Corp Bulletin, Section Nr. 572-115-103, Operating Principles, 28 Stunt Box.
b. TTY Corp Bulletin, Section Nr. 573-115-200, Installation of Function Bars on a 28 Stunt Box.
c. The 28 Stunt Box, A Bell System color brochure that, unfortunately, is out of print, but nevertheless a good reference, if you can find one!
e. TTY Corporation Bulletins 216B (Desc), 217B (Tech & Adj), 1149B (Parts) Model 28 KSR (Additional Bulletins for ASR as required). While everyone who will have ready access to the above references, they are listed in the interest of providing as complete a list as possible. The TTY Corp. Bulletins may be purchased from that company.

Behind the front plate of the printer unit, there are eight code bars that can shift left (marking) or right (spacing) when the appropriate signal is received. The second through sixth code bars are directly associated with the five elements of the received teletype signal, while the top (first), seventh, and eighth code bars are independent of, or indirectly from, the received code. Of these border code bars, most amateurs will be interested primarily in the bottom two; the seventh usually being the "zero" code bar used by amateurs for auto CR-LF, and the eighth being the letters-figures shift bar. The top bar is infrequently used, such as call sign recognition activation/inhibit, mechanical SEL-CAL operation, or excessive line feed protection in which case it will be moved between the print or non-print positions upon receipt of the proper code, but is generally locked into the print condition by a small clip on the -- side left of the printer, at the end of the code bar assembly. These three bars are moved left or right by movement of a shift fork mounted on top of the stunt box that engages a post over the code bar assembly. The stunt box itself is an assembly that mounts on the code bars and contains various function bars to interact with the eight code bars. When you look from the back of the machine (with paper roll/spindle removed) you see the top and back of the stunt box, with unshift-on-space screw on the top left, then the figs/ltts shift slide, and perhaps some electrical switches. Protruding and visible from the rear of the stunt box are pawls, levers, spring plates, and the outer tip of the function bars. A large flat vertical blade (stripper blade) goes across the rear of the stunt box, and is an integral part of the box on Mark III printers (on Mark I this blade sticks through a slot on each end of the printer and is externally operated). This stripper blade releases latched levers on its downward motion, and releases operated function bars on its upward travel. On every complete rotation of the main printer shaft, each function bar is allowed to move forward under spring action against the code bars in front of it. If the code received (and code bar alignment) is such that the times on any individual function bar, that bar then moves fully forward so as to engage the pawl in its slot. All function bars then are moved, and those pawls that have been engaged are carried rearward sufficiently so the pawl rotates its associated function lever backward. This lever is the piece that actually accomplishes the desired operation, such as opening or closing a switch, space suppression, carriage return, etc.; it is also used to control external equipment. Essentially, each of the 42 slots in the stunt box may be made to perform a function by installing the appropriate function bar, lever, pawl, and spring plate in that slot. The function bar is "coded" by times on the end adjacent to the code bars which are set either right or left of center to correspond to "mark" or "space" position of the code bars which is set upon receipt of the received signal. Figure 1 is a chart depicting the various function bars. Functions performed by the stunt box can be classified as required and optional. Required functions are those of carriage return, line feed, letters and figures shift, all of which are usually assigned to specific slots. Normally, space suppression is also provided with certain of these functions. Optional functions are any desired by the individual to respond for bell, WIU, reper control, and may be assigned to any of the slots not used by required functions. The required functions require certain slots to be used for specific operations, on all but a very few old printers, slots are originally equipped with the following minimum functions furnished: Slot 1 - Space (unshift-on-space usually equipped by disabled)

Slot 2 - Figures

Slot 3 - Letters

Slot 4 - Carriage Return

Slot 5 - Line Feed to provide CR on receipt of LF

Slot 6 - Auto CR-LF (for Auto CR, Blank, LF)

As Irv Hoff carefully explained in his Mouse Machine articles, this original setup should be modified for amateur use so that a printer will have the "standard three" features commonly desired for RTTY use. (Non-overline, Auto CR-LF, Unshift on Space). This amateur modified setup then uses these slots with functions bars coded as indicated:

Slot 1 - Space (with top mounted screw backed out for unshift on space enable)

Slot 2 - Figures

Slot 3 - Letters

Slot 4 - Auto CR-LF (for Auto CR)
or Blank, thereby saving one slot. This special coding is accomplished by breaking off the top line of either a CR or a Blank bar, allowing it to respond to both functions.

With this lineup you will have a printer that does all the things you will really need for RTTY operation; the only initially strange characteristic of this configuration is that nothing will happen locally when you type a CR and LF will occur whenever a LF is typed. And, you have 31 empty slots to code for any options you may desire!

Now, the interesting part of the entire stunt box study - just how do you use these 31 slots? Customary, of course, is equipping one slot with a function bar coded for upper case S or bell. Many machines also have this installed at the factory. If you don't like a raucous bell in the shack, you can instead hook up a chime as has been done by several enthusiasts.

Perhaps here is the place to briefly cover the variable features of the levers and plates used to equip slots to respond to sequential characters. The function bar is obviously coded for the desired action. Function levers (there are more than two dozen kinds) can be obtained that:

a. Operate electrical switches
b. Suppress spacing
c. Latch until released upon specific code
d. Latch until released on specific character
e. Operate sequentially
f. Operate a character (Figs/Ltrs)
g. Move bottom T-bars (blank-black, CR-LF)
h. Perform practically any combination above!

There are three different spring plates; plain, latching (one character), and latching (bail release). Figure 2 is a pictorial explanation of Lever and Plate variations. Sequential operation is used for the many station control features that are being used by many amateurs throughout the world with Model 28 machines. From figure 2 it can be seen that blocking and latching arms are available to operate a two-position lever function. Assume you want to have the sequence “Figs - Blank - H” operate an electrical switch (commonly used for transmitting “turn-on” of CW or CW ID as part of a longer sequence for WRI, turn-on (N.O.). You would use a latching sequential lever in the “Figs” and “Blank” slots, and a plain lever in the “H” slot. Of course, each slot that has a latching lever would have a latch spring plate and a normal pawl. Over the “H” slot you would mount an appropriate switch. Now when the character “Figs” is received, not only does the Figs bar slot 2 operate, but so will the one you have added for this sequence. This additional “Figs” bar and pawl moves rearward and will rotate and latch its lever, and the lever's block or latch arm which is the bottom of the next higher slot will move out of the way allowing it to operate on the next cycle. Similarly, if the very next character is a “Blank”, the lever will unlatch the next higher slot, where you have an “H”. If the next received character is “N” then one of the two functions will slot 2 rotate and operate the switch mounted on top of the stunt box. Note that if any other character or garble is received in the midst of the sequence, the switch will not operate, as the stripper blade will unlatch all latched function levers on the next received character. As long as the blocking arm of the lever is not latched out of the way, the function bar of the next higher slot can not be "selected" or move forward into the code bars.

Sequential operations are the heart of all station control schemes; they always consist of two or more slots coded so as to respond to the desired sequence of characters. The presence of codes is used where more protection is required, such as WRU or reperf turn on; the shorter sequences are adequate for such things as CW ID. One should determine that codes are usually designed using character sequences that do not commonly occur in normal conversation.

Here is where your work comes in deciding what features you want in your station. A worksheet has been prepared to assist in planning your particular stunt box configuration. When considering optional function, it is essential that an electrical diagram for your station control scheme be made at the same time. A sample of a filled-in worksheet together with its associated station control is attached as Figures 3 and 4. This station control scheme is essentially that published by Irv Hoff, W6FFC, in the May 71 RTTY Journal, and modified for replay control, 4 N’s deactivation, and CW ID changes. Figure 3 has been laid out with the author's call sign and for use with a Model 28 ASR, and in addition to the "standard three" features, has as options the following:

a. WRU
b. Reperf remote on/off
c. Figs, 67H shut down
d. CW ID
e. Bell on Bell, BK, and call sign

f. Station control arm/disable

It should be emphasized here that each individual should analyze his own requirements and equipment before he decides on what kind of station control he needs or wants. This sample is just one approach to the problem, and is not in any way the only or necessarily best way of accomplishing this. Several other approaches to station control are possible, from more mechanical use of the stunt box to a "pure" electronic logic approach.

Figure 4 is the associated circuit diagram that was made to complement the stunt box layout. It would be helpful if the reader would place these two figures side by side as he proceeds through the following explanation.

One factor that becomes apparent when a stunt box is removed from the printer is that there are only certain specific places that shift forks and switches may be mounted on top of the box, due to the location of the drilled and tapped holes. Since our example does not use any shift forks other than the normal Figs-Ltrs fork on the left end of the box, it will suffice to say that additional shift forks can only be mounted where the two large tapped holes are found across the top of the stuntbox. Electrical switches can be placed more frequently; however, to get maximum utilization out of the switch assemblies, they too should be planned (also for neatness and economy). Switch blocks come in double or quadruple units, and are attached so that they will work over one to four slots, beginning with an odd
In the meantime, look for Bob on 29490 kHz.

No activity from the Philippines for quite a while but via Gin we hear that DU1POL is now QRV.

We understand that OI-9ERI has had contact with DX but further info not available at the moment.

VK9XW has filtered through to the East Coast USA during the early morning hours recently, so keep listening.

QSL’s are being sent for the VP2 MRW operation so a SASE will get a card from Knobly. QTH listed last month.

Ariel, 4X4MR, is out of QSL’s for the moment, but it has been suggested that a “homemade” card with all the QSO information does get results.

IC8SMY, while counting as Italy is a good catch for the prefix hunters. He has been quite active and is located at--

P.O. Box 39, Ischia Porto, 80077, Italy.

Larry, K1LPS/18, and formerly KG6NAA, recently traveled through northern Europe and had the opportunity to meet the boys at OZ4EDR and club president of the SARTG, OZ4FF. Larry is on the down side of his duty tour and expects to be ‘on the air’ again sometime next year. So you fellows needing Vermont to complete WAS be patient just a while longer.

Mike, OY1M, had some machine troubles causing a short QRT but seems to be back in business again. In addition to the home QTH previously published, he does have a QSL Manager and this route may be more convenient, it is--

R.F. Huntington, W6TCQ
5014 Mindura Drive Torrance, Ca. 90505

Congratulations go to the following stations for -

** WAC **

Nr. 232 James Sims
WSRYA

Nr. 14mh.
WAC 14mhz.
Nr. 2 Howard Markwell
WQMT

Nr. 3 James Sims
WSRYA

Nr. 4 Hans Shalk
DJ8BT

Nr. 5 Kungl. Sodermanlands Regemente
SL5AR

Nr. 6 Heinz Lammel
DK4Z

** WAC 21mhz. **

Nr. 1 Howard Markwell
WQMT

Nr. 2 Hans Shalk
DJ8BT

Well, now that everyone has had a good long rest, it is time to get set for the Volta Contest which should take place in about a week or so. OX3JW should be active in this one.

The recent articles published using the UART and FIFO chips caused a tremendous interest in their use for RTTY terminals. Pete, W6KS, has been making them available at about cost and postpaid stateside and now passes word that he can make to DX stations also. Units can be sent at the airmail letter rate and he has had success in doing this to several countries. See Pete’s offer in the Classified Ads to obtain these hard to get items. In the next issue we will run the RTTY DX HONOR ROLL. Toup-date your listing, please have the totals to me by 1 December. Those wishing to participate for the first time just send me two numbers, DX worked/DX confirmed, no list or QSL’s needed until 100 confirmed is reached.

Since this is the December issue it indicates that another year has passed. In our age bracket there is a tendency to ignore the fact that “time marches on”, but regardless, 1975 is just around the corner. All we wish you and your families a very Happy Holiday Season along with sincere thanks for your support of this column by your timely and informative contributions throughout the year.

*** 73 de John

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The ASR front panel over the TD, of just about any convenient spot to the operator, Indicator lamps should be near the switches. The relays themselves can be mounted on the LESU or in the basement of the machine; the only caution is to ensure isolation of the CW IDer from noise in the machine and learn first hand just what operations are needed. The author wishes to thank all who provided ideas and encouragement for this article, especially Fred WA1DLZ whose assistance was most helpful.

**WRTU** - Literally "Who are you", but used here to define an automatic short answer back that acknowledges a call.

**A plain lever will permit momentary operation of the electrical switch. It is important to have the switch operated for an entire character interval (163 ms), a latching lever may be substituted.***