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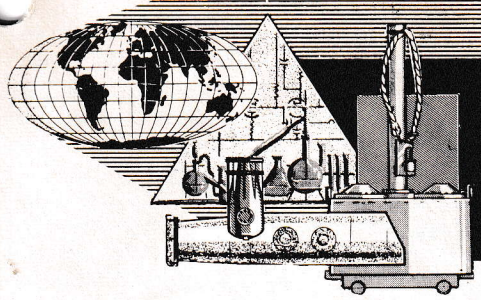
No. 2-64



mine and depth-charge

THE TROUBLESHOOTER

- Guidelines For FSMT Planners
- Aid To Mk 27 Assy.
- Loading Effects

AN OFFICIAL *BUWEPS* PUBLICATION

in this issue . . .

THE TROUBLESHOOTER

mine and depth-charge

Published by the Naval Mine Engineering Facility, Yorktown, Virginia.

Frederick F. Jewett, CDR., USN.....Officer-in-Charge
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REGULAR FEATURES

ARTICLES

COVER PHOTO: A section of the latest addition to the pier on the York River at the U. S. Naval Weapons Station, Yorktown, home of NMEF. In the foreground is the new vertical lift bridge which permits shallow draft craft to tie up on the inside of the U-shaped pier. The 25 gross ton portal crane in the background is a new addition to the pier's equipment. These new facilities greatly increase the Station's capability for loading all types of weapons aboard Navy vessels.

1 MAY 1964

By direction of the Chief, Bureau of Naval Weapons, Troubleshooter is an official BUWEPS publication. Technical content pertinent to the assembly, testing, and delivery of US naval depth charges and mines is both authoritative and directive in nature, and reference may therefore be made to a particular issue as the authority for adoption of ideas promulgated therein. Content which does not fall in this category is reasonably verified before publication but is not to be considered official nor representative of official BUWEPS doctrine.

Troubleshooter is also the official journal of the Rudminde Program, a world-wide defect-reporting campaign designed to promote a high level of undersea warfare readiness in US naval depth charges and mines. The Program's basic instrument is NAVWEPS Form 8500/5 (1-63). Everyone who encounters problems with these weapons is encouraged to report them via this form direct to the Naval Mine Engineering Facility as prescribed by BUWEPSINST 8500.8.

Troubleshooter is published quarterly by the Naval Mine Engineering Facility's Publications Division and printed by NPPSO-5ND, as approved by the Secretary of the Navy on 21 February 1962. Contributions, questions, address changes, and requests for regular distribution should be addressed to: Editor, The Troubleshooter, Naval Mine Engineering Facility (Code Ts-2), Yorktown, Virginia, U.S.A. Request copies of back issues from the Naval Supply Depot, 5801 Tabor Ave., Philadelphia, as instructed in NAVSANDA Publication 2002.

THE OFFICIAL JOURNAL OF THE *RUDMINDE* PROGRAM

RUDMINDE REPORT TO THE FLEET

The place for testing instructions

Some problems refuse to lie down and die. Like the long hanging question of which instructions you should use when you test depth charges and mines, or their components. We took our first shot at this one way back in T-Shooter 2-59 in a story on page 6 called Cool Rule, wherein we pointed out that little attention had been expended over the years in up-dating the plastic-laminated test instructions fitted inside your test sets, stating NMEF and BUWEPS (then BUORD) policy for activities at all levels as follows: "always test mines and mine components using the test instructions in the OP that tells you to test."

A near miss

Such was our first shot at self-contained test-set operating instructions. Everyone agreed that it had struck home, Rudmindes reporting errors in test-set instructions dwindled to zero because all hands stopped using them, several depots and stations wrote expressions of thanks, and we set about taking follow-up action to instruct all hands to remove and destroy those outdated cards.

But lo and behold – smack in the middle of these last rites – our victim got up, took a deep breath, and sauntered off into the sunset. Someone "up there" had decreed that it couldn't be done!

Miffed, we smoked and pondered through the darkness that followed, eventually perceiving that silence, even when it is not golden, can be strong. So in T-Shooter 1-60 we took a small pot shot in a story we candidly called "A Policy in the Clouds is for the Birds." But it was at best a glancing blow, after which we sat back, let the "Cool Rule" policy rest unchanged, and waited.

Meanwhile, back at the ranch. . .

Why, you may ask, do we feel so strongly about tolling the knell for those test-set instructions? All you have to understand is the details:

▶ They compound unnecessary duplication. OPs tell us what to test, when to test it, and how to test it, all in one package. To quote the most commonly-heard comment on this from the Fleet, "who needs more?"

▶ The self-contained instructions are too complicated and too costly to keep current. Suppose that for one of a hundred and one reasons the instructions for a test have to be changed: Since those self-contained instructions are part of the set, they're also part of the set's design documentation. Such changes therefore begin with the documentation. First a draftsman has to revise the master drawing. This leads to revisions to LDs and maybe MIL SPECS. Engineers at varying levels, for varying reasons, have to study and appraise and approve each revision. Money. Then each revision has to be reported in Design Department Reports. Then each revised master has to go through a new microfilming process. Then everyone who maintains IBM microfilm files has to put in the new and take out the old. Money and time. And still nobody in the field has his revised instructions. Before they can even be readied, somebody now has to let a contract to print and manufacture them, because only a few commercial printers and no Navy printers have the costly machinery. Then they have to be distributed.

▶ The Navy has no supply and distribution system for revised test-set instructions. This means individual packaging, addressing, and mailing oddball-sized objects to all test-set users. Then at depots holding reserve stocks of the set it means pulling the sets from warehouse stocks, unpackaging or uncrating, and then repacking every time there's a change. And still we're nowhere, because there is no system whereby test-set users can determine whether the instructions in their sets are the latest. And still – even after all this – the OPs would have to be changed to conform. That's why, to the best of our knowledge, the test sets for no other weapons now contain operating instructions!

▶ Self-contained instructions pose security problems. In some cases test sets by themselves would offer no classified information, but the operating instructions they contain do, making the test sets classified and thereby introducing costly storage and handling problems.

Vive la difference

Now let's suppose that, as for other weapons systems, operating instructions for mine and depth-charge test sets were to be found only in the documents that tell what to test and when and how to test it – the OPs. Now all that's needed to change the instructions is a piece or two of paper – an OP Change. OP changes are produced by technical writers with minimum engineering red tape. Any Navy printer can print one. No documentation changes are needed. Cheap. Distribution is by automatic machinery at NSD/Philadelphia, to every US and allied holder of the OP. Fast. And cheap. Spare copies are available to all hands at no cost, via NAVSTRIP. Newly-commissioned ships and all newly-mobilized units receive them in the course of their initial outfitting. Automatic. On time. Dependable. Simple and cheap.

Rest in peace

Surely we need not say more, except to report that at last one of our T-Shooter shots has struck home. In the course of the most recent semi-annual mine conference (about which we'll have more to say in this column in issues to come) representatives from CNO, the Atlantic and Pacific Mine Forces, and BUWEPS, agreed that self-contained test-set instructions should get the deep six.

So meanwhile what should field activities do? Do just what you and we at NMEF have been doing since Issue 2-59. Ignore the self-contained instructions in your sets, most of which for obvious monetary reasons have not been up-dated since World War II. Instead: always test mines and depth-charges and their components using the test instructions in the OP that tells you to test.

This applies to all depth charges, and to Mines Mk 6 through Mk 55. This is cost-reduction. It's official. The directives are coming.

REALISTIC TEST RESULTS GOAL OF FSMT PLANNING

IT is axiomatic that in any test, or program of tests, the objective is to acquire a maximum yield of useful data for each dollar spent. It is the aim of this discussion to encourage planning officers to accept this measuring stick in connection with the Fleet Service-Mine Test Program (FSMTP). . .to explain how they can make the cost better return its worth in results!

The primary purposes of the FSMTP, of course, which is not an NMEF program, but a CNO program which NMEF monitors for CNO and BUWEPS – is to maintain current operational reliability knowledge of all service-approved USN underwater mines. To this end the scope and objectives of the FSMTP as stated in CINCLANT(PAC)FLT INSTRUCTION 08550.1x permit the planner almost unlimited use of his imagination in setting up test conditions that approximate service use. This, we feel, is all to the good.

A need for change

Unfortunately, though, there's no escaping that overall need for value in the data collected from the tests. And to get it we feel that certain limitations in the simulation of service conditions now warrant FSMT planner's consideration.

Within the framework of this reasoning, the FSMTP Brochure* attempted to standardize certain phases of the program. Now, as a result of two FSMT conferences in which representatives of virtually all participating activities have examined and re-examined various phases of the program, a new edition of the Brochure is in preparation, in which the chapter on planning and logistics, among others, will receive considerable revision. Especially affected will be the philosophy of mine operational settings prescribed for FSMT mines – an attempt to better reflect CNO's fundamental reason for conducting and funding the tests.

Why planners must help

To understand how test planners can assist in this area you must understand that each FSMT is what statisticians call a "go/no-go attribute data test." Briefly, this means that the mine works satisfactorily (for test purposes), or it doesn't. We need to know whether the mines actuate or fail to. But that's all.

Determinations such as how many mines actuate at 10, at 20, or at 30 yards from the target, or evaluations of the effects of variations in tactics or doctrine, do not provide data that is measurable in go/no-go attribute data tests.

Instead of variations, then – for best statistical results – all mines within a given test of this type, ideally, should have identical characteristics, and should be tested under identical conditions. The reason: the greater the limitation of variables in test conditions, the larger the statistical sample sizes that will be obtained from a given number of test mines. And the greater the sample size, the greater the yield of reliability knowledge from each test will be.

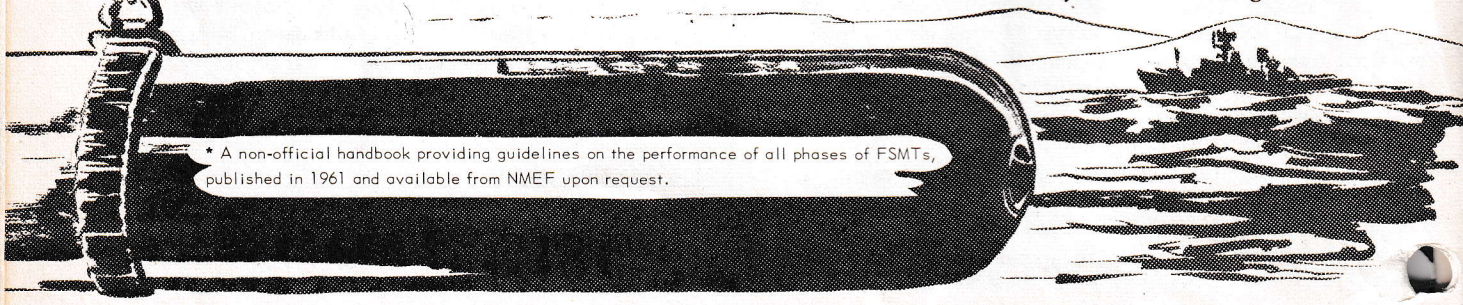
To the degree that they exist, then – and we realize that they must always persist to some extent – variations in test conditions within a given test can only add to the problems in statistical analysis of the tests. This is why we must now insist that it is through reduction of these variables, rather than through their multiplication, that the usefulness of the tests can be increased. Understand, though, that we are pressing only for more elimination of variations in conditions within single FSMTs. Variations between FSMTs would naturally reflect decisions based on the individual test situations, and are accepta

So what the revised Brochure will recommend, and what we recommend here, is greater uniformity among test-sample mines, and in the conditions established for each test, than has been the practice in the past. . .thus to collect information that will be more useful for inference in predicting the reliability of our mine weapon systems.

And that's not all

But uniformity is not the whole answer, either. Because of the go/no-go feature of FSMTs, planners should be more careful to specify mine operational settings that are commensurate with the expected type of actuating effort. For example, if a test mine's sensitivity is set for a tanker in a test in which a submarine is to be the target vessel, the mine may well fail to actuate. And if it does fail it will be classed for test purposes as a failure when in fact it may have been in no way defective.

Settings for the amount of actuating effort must also be selected with care. Suppose the mine's ship count has been set for 3, but only 2 counts are registered because



* A non-official handbook providing guidelines on the performance of all phases of FSMTs, published in 1961 and available from NMEF upon request.

too few passes by the target vessel. Again the mine has failed in terms of test statistics. The fact is that the odds favor mine actuation most when the mine's actuation counter (ship count) has been set at one. In all cases it's that inescapable go/no-go process at work!

What planners can do

In examples such as we have cited, you can see that the planner who specified the settings didn't give the mines a chance. Instead, he reduced the effective sample size and with it the effectiveness of the test data, and it is for just this reason that we now invite FSMT planners to consider the following recommendations:

- ▶ Restrict the number of combinations of mine operational settings you prescribe in a given test. This will increase the number of comparable trials within each test.
- ▶ If you must specify two or more combinations of mine operational settings within one test (perhaps to take advantage of the luxury of two different types of target ships!) try to specify the same number of mines per combination, so that the combinations will be tested with equal strength.
- ▶ Base your selection of the test mines' operational settings on achieving a good go/no-go actuation result under the actual environmental conditions of test site, the actual type of target vessel to be used, and the actual amount of actuating effort to be expected.

GREASY KID STUFF ON YOUR PINGER?

Rumor that some shops are using petroleum-base lubricants between the diaphragms of pingers (Transmitters Mk 62) and mine cases has now been confirmed.

The word? Don't! Use only Grease, Silicone, Z9150-200-5358 (8-oz. tube). That's what the forthcoming installation instructions for OP 3233 will say. Anything else can impair acoustic coupling if it gets warm, and will rot the "rubber" diaphragm, but fast!

So, gung ho!

As we said at the outset, FSMTs are specifically not NMEF tests. But it is NMEF's job to provide CNO with statistically-computed FSMT results that will equip top-level planners with up-to-snuff reliability knowledge on which to base war plans. By following the suggestions outlined above, FSMT planners will be helping to make that job, and thus the Navy's mine-warfare job, "well done."

HOW TO PUT FIX ON STERILIZER SETTING

IT has been reported that some Sterilizers Mark 11 Mod 0 (two used in Mine Mk 53-0) cannot be set to zero ohms. . .that the zero setting produces a reading of 4 ohms on Test Set Mk 237 Mod 0 and that's about as close as you can get. The reason, we find, is simple: the sterilizer's adjusting knob strikes the knob's locking screw. This means you can usually fix as follows:

- ▶ Set the knob as far counterclockwise as possible.
- ▶ Loosen the set screws that hold the knob to the potentiometer's shaft.
- ▶ Set the knob up so its index reads a few graduations upscale from zero.
- ▶ Run set screws down so that they bear on the shaft, but can slide under leverage.
- ▶ Return knob firmly to zero position (slippage should now permit both knob and pot to make zero).
- ▶ Tighten the set screws.

Now a reading of zero should be obtained on your test set. If it doesn't, though, don't worry. If after the above adjustment the set's reading is within 4 ohms of zero you can accept it as a zero reading.

Why? Because these sterilizers are adjustable to provide sterilization at from one week to one year after planting, and it's only to get a very minimum setting with one set of environmental conditions that a zero setting is needed. These conditions, stated in table 4 of OP 2370, are for a sea-water temperature of 30° F with 1% salinity, a circumstance in which 4 ohms would add ss than 3 days to the mine's minimum armed life.

All other temperature/salinity/time combinations require settings of more than 4 ohms.

If you're wondering, OP 2370 is being changed to agree, and there's a write-in in Pub-S-Crawlin' to fix that book until the change gets out.

THERMAL SWITCHES OUT

THERMAL Switches TS-1 and TS-2 formerly used in Mines Mark 27 have been declared excess to present requirements for underwater mines as a result of standardization action, so will be removed from stocks. This leaves Thermal Relay Mark 24 Mod 0, 1350-707-0613, as the preferred item. The obsoleted thermal switches are of the solder-pot type and due to the erratic melting point of the solder-pot are considered unsatisfactory. The Thermal Relay Mark 24 is a fuse-wire type of greater reliability.

Appropriate OP changes have already been made, but there is still the possibility that depots could issue TB-11s Mod 0 (for assembly in Mines Mk 27 Mods 2 and 4) that still have the old solder pots mounted on them as a result of non-performance of Ordalt 4211 of 8 June 1959, which anticipated this standardization action by converting these TBs to the new thermal relays. This does not mean that all depots should therefore promptly screen their stocks of TB-11s, but it does mean they should make it a point to check them out at time of issue, and should replace any solder pots found at that time.

Heat Coil Assembly 1350-038-7052 has also been declared obsolete.

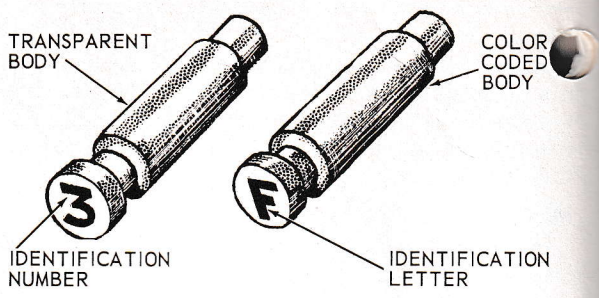
BLIND ALLEY'S END

ONE of the several problems awaiting men who'll assemble Drill Mines Mks 52, 55, 56, and 57 is the lack of test specs for the "numbered" resistor plugs for Mk 10 sterilizers.

Now the service versions of these mines use "lettered" plugs that can be tested by Test Set Mk 204. But it would be quite a job to modify that set so it could also handle the drill mines' numbered jobs, and they're not covered in the OPs either.

So what's to do? Check values per the table below using your trusty multimeter. Accept plus or minus 15 percent.

Resistor Plug	Resistance (Ohms)	Resistor Plug	Resistance (Ohms)
3	1425	23	11000
4	1900	28	13300
5	2375	32	15200
6	2850	34	16200
7	3325	36	17100
8	3800	44	20900
9	4275	52	24700
10	4750	57	27100
18	8550		



DO YOU OR DON'T YOU?

. . .like ye T-Shooter, that is. Whether you do or whether you don't you'll find a few gripe sheets inside the cover of this issue, and you'll find that they pull right out, and you'll find that they give you a chance to sound off.

And we hope you will. The only way a periodical like T-Shooter can stay in business and try to do a good job is by knowing the answers to questions like those we have posed.

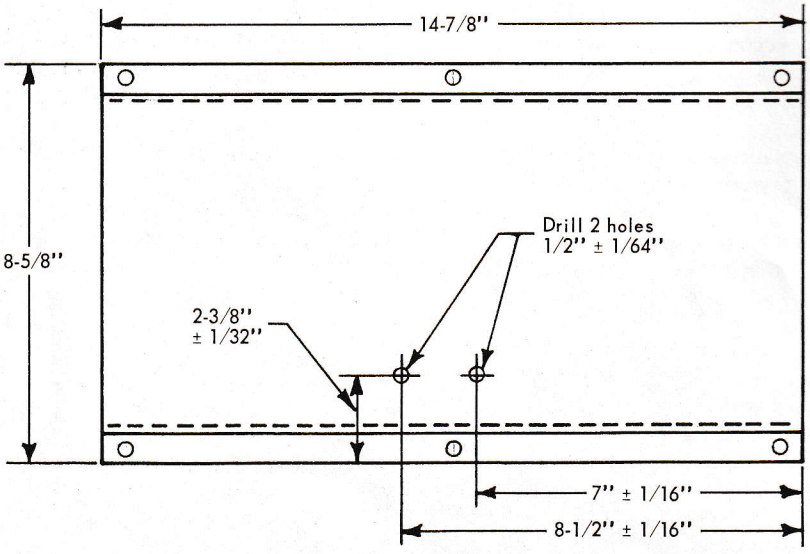
So fill one out, please. Get other men in your outfit to fill 'em out, too. It'll take you less than a minute to tell us that you do or you don't.

HOLES IN TWO

EVERY time the settings on the Control Box Mk 39 Mod 0 and Mod 1 have to be changed in the field, and it is done frequently, the instrument racks in Mines Mk 52/55 have to be pulled clear out of the mine's tail, six screws removed, and the cover taken off. Then back goes the cover, the six screws, and then you have to jockey the instrument rack back into the mine. There had to be an easier way. . .and the man who suggested it was Gordon Webster of the Ordnance Department at the Naval Weapons Station, Yorktown.

All you have to do is drill two half-inch holes in the instrument cover directly over the control box's adjustment screws, just like we show here. After that you can simply pull the instrument rack halfway out of the mine, make your adjustments, thank Gordon, and push it back.

New procurements of the rack will be manufactured with these two holes. Meanwhile – when you receive racks that are already in stock – it'll be well worth your while to drill them.



HOT STUFF

by B. Arnaclebutt, MNC

Saved by salvage

Dear Barnacles,

When we drew SD-4s for Mines Mark 25 Mod 0 to be used in a recent FSMT, we got no screws for the strain loops of our CA-530s. This was true for nine out of nine, for which we robbed some Code X SDs. You have maybe another solution?

A.O., MN2

Dear A.O.,

Somewhere. . .sometime. . .in the course of a nearly forgotten depot screening. . .it seems there was a certain population of SD-4s from which the cans were removed. In the doing, the three screws that hold the cover to the SD and also provide screws for those strain loops were removed too, and although one of them should have been put in the pack after rework, it wasn't.

So there you are! Under these conditions robbing Code X to insure a good plant is okay as long as Code X lasts. The alternative: equip yourself with a supply of Screws, Fillister-Head, Slotted, Brass, No. 10-24 NC-2A x 3/8", KZ5305-577-5527.

B. Arnaclebutt

Go by the book

Dear Chief Butt:

In the assembly of Mines Mark 25 Mods 0 and 2, failure to trim leads of Detonators Mark 46 Mod 1 down to six inches is preventing their full extension by the extender. We found this assembly in post-recovery analysis of each of the 18 mines checked . . .a hitch that could have caused 18 duds if it had been a wartime XPL plant. We think this is serious enough to warrant emphasizing the proper shortening of those det leads!

P.C.D., MN3

Dear P.C.D.,

Eighteen out of eighteen is certainly not a slip of the snips, and for once we can't blame the assembly manuals. The straight skinny is in paragraph 59 of OP 956 and also of OP 1765. So what say, men, let's do this job by the book!

B. Arnaclebutt

No so untouchable

Dear B. B.,

You said in "The Untouchables" that there is not and never has been a spacing requirement in connection with field stowage of SRs. How about page 14 of NOLR 1204 which says "at least 1-3/4 inch apart at all times." Doesn't "all times" include field stowage?

S. K. R.

Dear S. K. R.:

Ouch! And thanks, too! But that's as far as I'm going to string along with ancient history. As of the year of

our Lord 1964 there is no requirement for spacing SRs in storage, and changes being processed on all assorted elderly documents that state otherwise will make this unanimous and universal from manufacturer to assemblyman. That includes par. 20 of encl (1) to BUORD ltr Re 7a:ELL:fmu X17/2 of 9 Mar '55 which can't be changed but certainly at this late date should be ignored.

– Okay?

B. Arnaclebutt

We aim to please

Dear Butts,

I've just seen NMEF's new loading check list for the P2E airplane (that's Supplement A to OP 3232–Ed.) and I want to go on record with my opinion that these things are the greatest thing since the wheel. I think any mineman type who takes time to study what you people have done will agree, especially where you veer hard away from the mine-assembly OPs and get right down to specifics, for the specific airplane. Like on matters such as which safety devices to use, which orientation of flight gear, what control-unit settings, whether or not to use weak links, and how many of which kinds of arming wires. Also on specifically what rate does what job – MN or AO.

This is exactly what the doctor should have ordered ages ago. Even details like mine-field numbers vs. airplane stations and what lug spacing to provide for each!

D. L., MN-1

Dear D. L.,

You are generous indeed. We appreciate. But in spite of your high esteem, or maybe because of it, we'll be trying to throw in more improvements as work on forthcoming check lists proceeds. One instance is that matter of lugs.

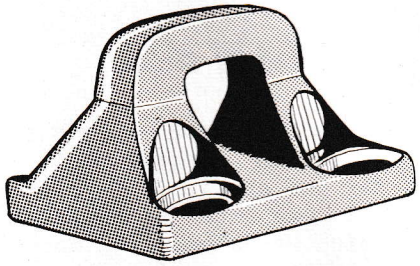
Supplement B (P2-H), which will be out shortly after you read this, will be about the same as your Supplement A. But the next two in the mill – Supplements G (A1-H/J) and N (A4-C/E) – not only specify the lug spacing for the various stations of those planes, but get right down to brass tacks on specifying special lugs for Mks 25, 36, and 39 mines when the mission will be carrier-based and the older WW-II lugs lack the moxie needed for catapult takeoffs or arrested landings.

The lugs to be specified for this use are not available yet, but they are being procured. The one for Mines Mk 25 and 39 will be Lug, Suspension, Underwater-Mine, Mk 12 Mod 0, DWG 2184307. They will be installed at the usual 30-inch spacing using four Lockwashers DWG 2425449 and four special screws DWG 2425450 (1/2-inch Allen-head) per lug, torqued to 50 ± 5 lb-ft. This one's simple, and forthcoming plane-loading check lists will tell you when it should and should not be installed.

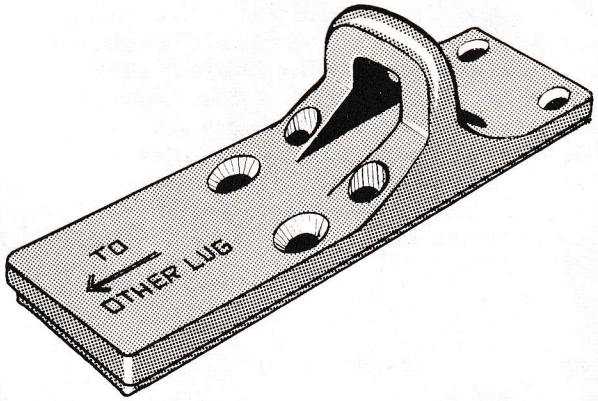
One that's not so simple is the new Lug Mk 13 Mod 0, DWG 2184306, also still in the procurement process. The gimmick is that there are some early Mk 36 Mod 2 mine cases, for which this lug is designed, on which the mounting block (welded to the case in the way of the suspension lugs, for 14-inch spacing) is in two pieces. That's all right for the WW-II lugs now in use, but strictly no good when the new lugs are specified. When they are you must select only newer Mk 36-2 cases on which that mounting block is in a single piece of steel that accepts both lugs.

Both new lugs are shown below. The Mk 13 Mod 0s each will fasten with six Washers DWG 2413718, six 1/4-inch Allen-head Screws MS 35457-50 torqued to 35 ± 5 lb-ft, and two 3/16-inch Allen-head Screws DWG 2290321-1 torqued to 25 ± 5 lb-ft. FSNs will be assigned and OP changes will pick up this info as applicable, when the lugs become available for issue.

B. Arnaclebutt



SUSPENSION LUG MARK 12



SUSPENSION LUG MARK 13

Save those pistons

Dear B-Butt:

During disassembly of drill mines after recovery we have been twisting off clock starter pistons when removing the center part of the Arming Wire Safety Lock. Corrosive action, through salt water between piston, and the safety lock, freezes the two together. Tried anti-sieze compound on piston threads before assembly and presto — no more trouble. Good idea?

N. N. J., MN2

Dear N.N.J.,

Perfect. Anyone who doesn't think so should talk to the crew at Navy No. 555 where they've been using anti-sieze as you've suggested with excellent results. Another excellent result is the saving of five bucks plus labor per clock starter. What more could Uncle's BUWEPS budgeteers ask?

B. Armadebutt

Keeping things straight

Dear B. Butt:

In our activity we handle both service and drill mine components with limited space for testing and sub-assembly which creates a problem in keeping stocks straight. It seems an instruction to stencil Code F material would keep things straight and be of help.

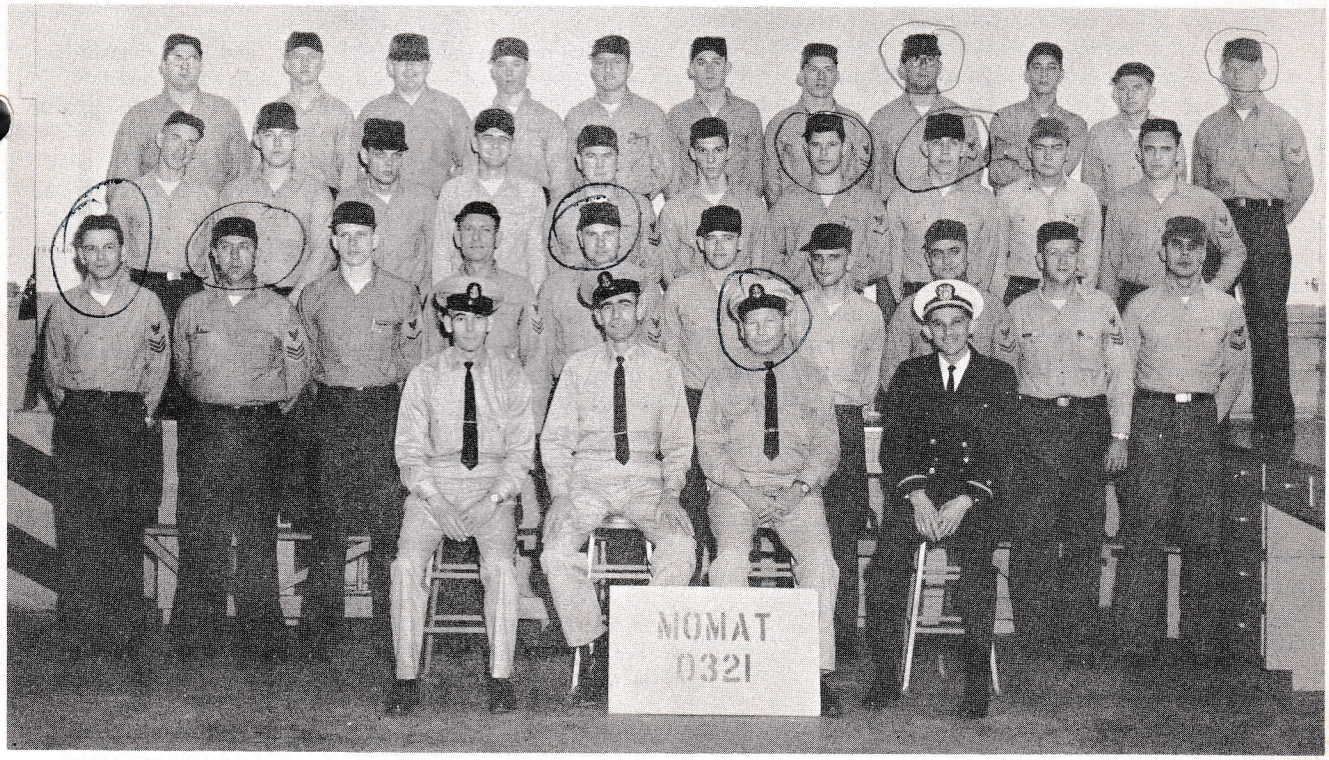
M.V.T., MN1

Dear M.V.T.,

Any method that keeps clear of a mix-up helps. A facility that has limited space and a requirement to stow service and drill components in the same area could use the method employed by the crew at Navy 555. They stencil all drill components except cushions, brackets, spacers, etc. with the words CODE F – AIR DROPPED in red letters.

This also serves as a quick identification when drill material is returned to depot stocks.

B. Armadebutt

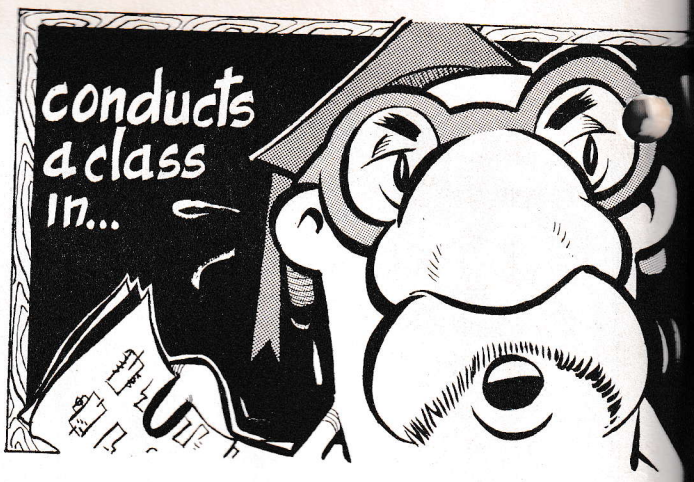


Mobile Mine Assembly Team (MOMAT) 0321, activated in August of 1963, and stationed at NWS, Yorktown, poses for its first group photo. Front row, left to right: D. W. Priest, MNC; M. L. McCune, MNC; H. L. Coker, MNCM; Ensign E. C. Oyer, Asst OIC. Second row: P. L. Reagan, MN1; J. R. Coffman, MN1; S. L. Sherwell, MN3; A. W. Neiderbaumer, MN1; F. Trestrail, MN2; J. A. Nearhood, MN3; R. R. Wilkins, MNSA; W. C. Sechman, MN2; F. E. Cole, MN1; H. L. Keeran, MN2. Third row: E. G. Matern, MNSN; D. G. Curtis, MNSN; R. B. Pricer, MNSN; R. H. Reblin, MNSA; J. A. Manning, MN2; R. B. Marks, SA; T. W. Phillips, MN3; G. R. Gracey, MNSN; S. R. Helms, MNSN; F. D. Fullen, MN2. Fourth row: R. D. Vanwey, MNSN; H. D. Harper, MNSA; N. L. Lalley, MN3; R. R. Foster, MNSA; J. R. Fodge, SA; W. D. Voyles, SA; E. F. Hall, MN2; J. J. Manzolli, MN3; S. P. Day, SA; J. L. Ellis, MN2; C. L. Booth, MN3. Not present for the photo: LTJG D. A. DeCrona, OIC; and R. B. Walker, MNCS.

Lots of luck, men.

A.S.W. MINERIGHT

WITH AN ASSIST FROM H.E. "PEPPER" SANDERS...



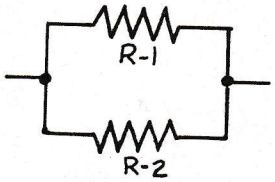
ALL too frequently Rudmindes indicate in one way or another that their writers do not understand the loading effects which voltmeters impose on various circuits. By "loading" we mean an undesirable but ever-present change in the apparent resistance of a component across which a voltage measurement is made. It doesn't occur when the meter is inserted in the simplest of all circuits – one battery with one resistor, in a series loop – wherein calculated voltages will not differ from those read on the voltmeter.

It is when you go on to circuits that contain two or more resistors in series or in series-parallel that loading effects can be expected. As we'll try to make clear, and as you can demonstrate for yourself by setting up the simple circuits we shall describe, voltage drops resultant from the application of voltmeters is part of the very nature of the circuitry involved.

Resistors in parallel

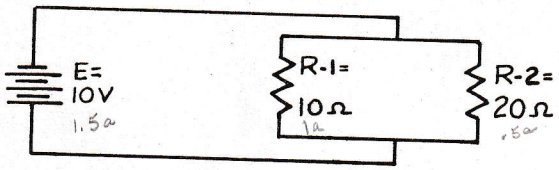
First remember that when resistors are connected in parallel the resulting resistance is always somewhat less than the value of the lesser of the resistors, hence the formula:

$$R_R = \frac{R\text{-}1 \times R\text{-}2}{R\text{-}1 + R\text{-}2}$$



For example, assume values of 10 and 20 ohms for R-1 and R-2. Substituting in the above formula gives a resulting resistance of $\frac{10 \times 20}{10+20} = \frac{200}{30} = 6.67\Omega$. The reason, of course, is that each resistor provides a separate path for current to flow and the two parallel paths provide an easier "flow" than either one by itself.

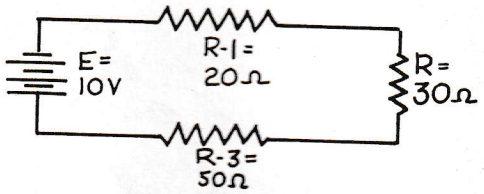
Now let's look at the example another way. . .let's connect a battery across the paralleled resistors:



If you consider each resistor individually you'll find by Ohm's law $\frac{E}{R} = I$ that the current through R-1 is $\frac{10V}{10\Omega} = 1.0A$ while the current through R-2 is $\frac{10V}{20\Omega} = .5A$. The total current supplied by the battery is 1.0A + .5A = 1.5A. Re-substituting in Ohm's law $\frac{E}{I} = R$ we find that the net resistance effect of R-1 and R-2 is $\frac{10V}{1.5A} = 6.67\Omega$ which agrees with our earlier answer.

The simple series circuit

So much for resistors in parallel. In the simple series circuit shown next, the battery is supplying 10 volts which

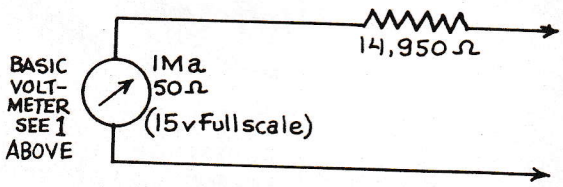


is being dropped across R-1, R-2, and R-3; Ohm's law will show us that a current of 1A is flowing, and that voltage drops will be 2 volts across R-1, 3 volts across R-2, and 5 volts across R-3. In other words, each resistor will drop that portion of the battery's voltage equal to its proportion of the entire resistance. ($\frac{20\Omega}{100\Omega} \times 10V = 2V$, etc.)

Next, some ground rules

Now before we see what happens when we try to measure voltage drops let us lay some ground rules to simplify the discussion:

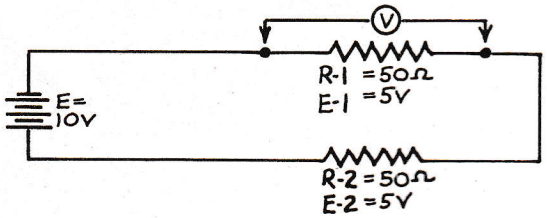
- ▶ The battery is capable of supplying an unlimited current at its nominal voltage.
- ▶ All resistors are perfectly accurate.
- ▶ Meters used are: 1) A basic voltmeter with a circuit comparable to that used in Test Set Mk 3 Mod 2 (1000 ohms-per-volt sensitivity. . .will appear in circuits as 15,000 ohms, per diagram below. Range is 15 volts full scale.); 2) An AN/PSM-4A Multimeter (20,000 ohms-per-volt sensitivity; set to read 10 volts at full scale it will appear in circuits as 200,000 ohms); and 3) A vacuum-tube voltmeter (VTVM), (input resistance of 11 megohms constant regardless of range).
- ▶ All meters and metering circuits are perfectly accurate.



VOLTMETER LOADING EFFECTS

And here's how she works

Now let us see what voltage drops would be calculated before connection and during measurement with our various types of meters in a typical circuit:

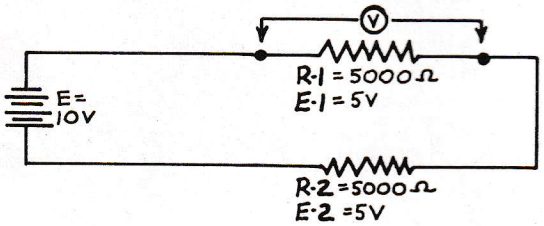


Calculation tells us that each resistor drops $\frac{5}{10}$ of the battery voltage or, in this case, exactly 5 volts. If we were to connect our basic voltmeter across R-1 the combination resistance would be: $\frac{50 \times 15,000}{50 + 15,000} = \frac{750,000}{15,050} = 49.83\Omega$. The combination would drop $\frac{49.83}{99.83}$ of the battery voltage or 4.991+ volts. (The remaining 5.009-volts would temporarily be dropped across R-2.) Such a slight loss from calculated voltage is insignificant and we would say that we had not loaded our circuit while taking the voltage measurement. *

Because the multimeter and VTVM substitute 200,000 ohms and 11 megohms respectively into the above calculation, in place of the basic voltmeter's 15,000 ohms, it can be seen that they will have even less loading effect, so it would be meaningless to calculate their effect. We can simply state that any of our three voltmeters will serve adequately in measuring voltages in this low-resistance circuit.

Higher resistance = more loading effect

Now consider what happens if we substitute larger resistance values:



* Note that the word "drop," as used in this article, means to consume or absorb.

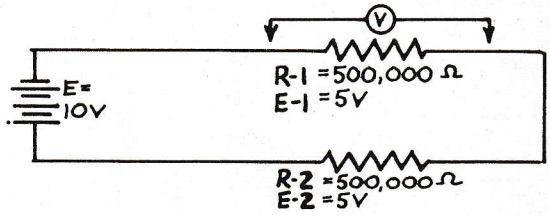
Again we will have a drop of exactly 5 volts across each resistor. But connect the basic voltmeter across R-1 and the combination resistance now becomes $\frac{5,000 \times 15,000}{5,000 + 15,000} = \frac{75,000,000}{20,000} = 3750\Omega$. This combination would drop $\frac{3750}{8750}$ of the battery voltage or 4.28 volts. . . .sufficiently less than 5 volts to be described as loading effect.

At this point it's both interesting and important to note certain facts that will become more apparent as we proceed. First, there will actually be a voltage "shift" whenever we experience loading while the meter is connected. In the above example, in which the meter indicated 4.28 volts, there are actually 4.28 volts dropped across R-1. But at the same time, there is a shift of .72 volts to R-2 (5 minus 4.28) raising the drop across R-2 to 5.72 volts.

What you have to remember, of course, is that both drops return to 5 volts immediately the meter is disconnected. And this gives us a rule: Regardless of the severity of loading, the total of all voltage drops must equal the source voltage. . . .in this case, 10 volts. With that in mind let us now substitute the multimeter for the basic voltmeter. The calculated reading will now be $\frac{1,000,000,000}{205,000} = 4,878\Omega$ across the combination of R-1 and the multimeter. The voltage reading would thus be $\frac{4,878}{9,878}$ of battery voltage, or 4.94 volts. Although this is somewhat less than the effect using the basic voltmeter, it would nevertheless have to be considered to be slight loading. Substituting the VTVM, though, the calculated combination resistance would be 4.998 ohms and loading (4.99 volts) will be negligible. For measuring the above circuit, then, the multimeter could be considered adequate, and the VTVM even better.

. . .and more

Now let us substitute even larger resistance values:



Again we will have a 5-volt drop across each resistor. But connecting our basic voltmeter across R-1 gives a combination resistance of: $\frac{500,000 \times 15,000}{500,000 + 15,000} = \frac{7,500,000,000}{515,000} = 14,563\Omega$. This combination would drop $\frac{14,563}{514,563}$ of the battery voltage or .28 volts. . .an example of ridiculously severe loading, and thus of a completely useless meter application!

Even the multimeter would result in a combination resistance of 142,857 ohms, which would drop $\frac{142,857}{642,857}$ of the battery voltage or 2.22 volts. So we must also relegate our multimeter to the useless category, because of severe loading.

Our VTVM fares better, but still suffers. Calculations will show a combination resistance of 478,261 ohms, dropping $\frac{478,261}{978,261}$ of our battery voltage or 4.89 volts.

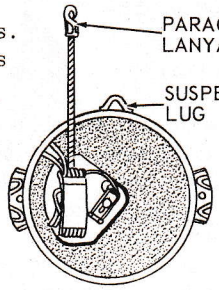
Continued on page 11

Aviation Section

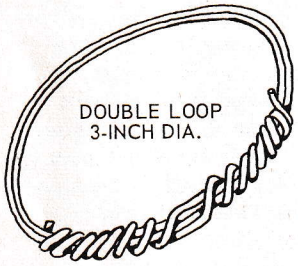
Devoted to items of interest to Aviation Ordnancemen

Parapak Mk 15... new rig for wing load

Until recently carriage of Mark 50 mines in Aero 14E racks on wing stations has not been allowed, pending procurement of Parachute Packs Mark 38 for the mines. The reason: older parapaks use parachute static lines, and the Aero 14E racks lack even the sway braces that are sometimes used on other racks for positive attachment of these lines.



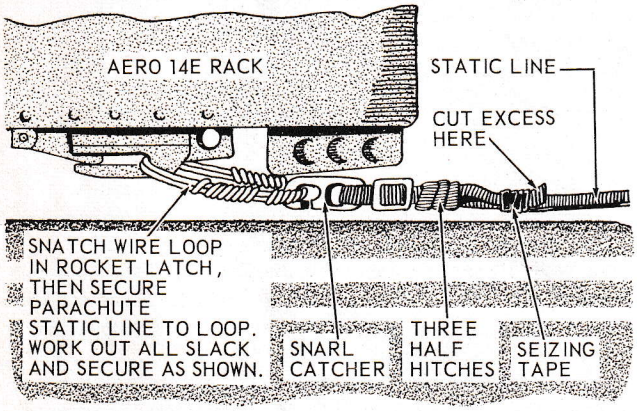
Now that policy has been changed. Recent flight tests with Aero 14E-equipped A1-H and J airplanes have proven the feasibility of flying Mines Mark 50 with Mark 15 parachute packs on wing stations when the following steps are taken:



▶ First make sure the pack is turned so the static line lanyard is straight up, as shown above.

▶ Second: make a double loop using arming wire remnant as shown at the left.

▶ Third: rig loop and static line from the rack's rear rocket lug to the lanyard (below).



Pending procurement of a newly-designed parapak (Mk 38) which will eliminate the need for static lines on the Mk 50 mine, it may well be that changes to loading check lists for the P2-E and P2-H airplanes will – through use of this method – make it permissible to fly Mk 50s on those plane's outer-wing racks. It will also be included in forthcoming instructions on loading mines on the P5-B.

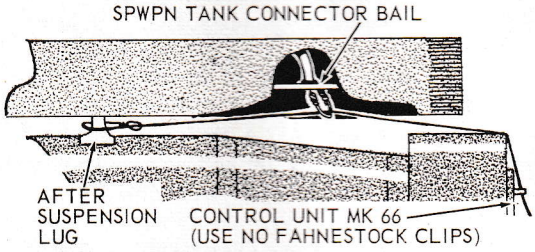
New parapak—new fin

Another restriction on flying Mark 50 mines has been altitude. With the advent of the new Parapak Mark 38 will come a new fin, designated Fin Mark 17, which will lift the present 3,000-foot maximum for release. For wing-carried Mk 50s, that is.

For 50s carried in bomb bays there's not enough room for the Mk 17 fins, while the Mk 16 fins – for which there is room – are too small to permit lifting the 3,000-foot release-altitude maximum.

Fitting control-unit arming wire

The way to rig the arming wire for Parachute Control Unit Mark 66 when loading Mines Mark 25 and 36 on wing stations of A1-H/J and A4-C/E airplanes is shown below. The wire is passed through the suspension lug and its own loop, through a bail-rod loop in the pylon, and from there to control unit's plunger. In planes that have no SPWPN Bail, attach the wire, positively, to an after sway brace.



More about arming wires

There is a castellated collar on Clock Starter Mark 1 Mod 4, used in Mines Mark 10, 25, and 36 that serves a purpose that may escape Aviation Ordnancemen when rigging the arming wire. It has multiple castellations of different levels so that the collar can be rotated to bring a castellation height in line with one of the holes in the piston rod for a snug fit.

This is the theory but sometimes, even using the highest level of castellation, a "snug fit" can only be approximated. Yet even in this case, choice of the right castellation will eliminate excessive play, and with the two fahnestock clips snugged against the castellated collar you'll have an acceptable arming-wire installation.

SOMETHING NEW IN LUGS

For an item of interest on the newest in mine suspension lugs see "We Aim to Please" on page 6.

WHO'S confused !

IT'S not that anyone has said they couldn't understand the business in the box on page 11 of T-Shooter 1-64, about the detection and disposition of faulty Parachute Packs Mk 20 Mod 0 for Mk 52 mines. It's just that instructions as to how good packs, bad packs, and limited-use packs are to be identified are several, and do not exactly agree.

First came an NOL/White Oak letter of 6 November '63, followed by a BUWEPS letter of 14 November, both of which we shall ignore because few of our readers received them and much water has since passed.

Next, though, came BUWEPS message 172005Z. Plenty of our readers have seen this and are aware that it and the T-Shooter 1-64 item contradict each other on the matter of how the good packs (okay for wing or bomb bay) and the limited-use packs (bomb-bay carriage only) will be stencilled to identify them, and to segregate them from packs that are restricted from use. In fact, the T-Shooter article and the message also differ on the condition code to be assigned to the non-usable packs.

How did this happen? Probably because the T-Shooter was being printed at the same time the message was prepared: the message writer wasn't aware of the T-Shooter slant and vice versa. And in any case there's no damage done. BUWEPS has had all Mk 20-0 packs screened, so all you now need to know is what to look for to find out if the 20-0 pack you're about to use is okay. And it's simple. In a few instances you may find stencilling only on the packaging, but in virtually all it will be on both the pack and the packaging. What it will say is: OVS 059-A accomplished. When you see that you know the pack is Code A. If it's not there, it's not Code A.

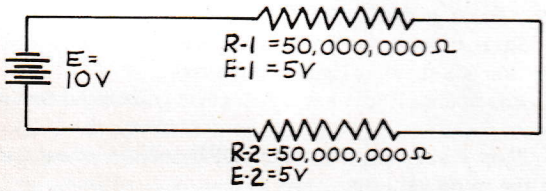
OVS, in case you don't know, means Overhaul Specification. These are specs prepared by NMEF for use by overhaul depots in upgrading material that is not acceptable for Code A. Soon you'll be seeing "OVS 057-A accomplished" stencilled on Mk 24 Mod 0 parapaks (Mk 55 mines) and OVS 058-A on Mk 26-0s (Mk 25 mines). The meaning? The same. With it they're Code A. Without it they should not be used.

So what about new procurement of these packs that don't need the OVS treatment? How identify? Don't worry. BUWEPS does not plan any further procurements of these three.

Continued from page 9

The proof of the pudding

To drive the point home, consider one more example:



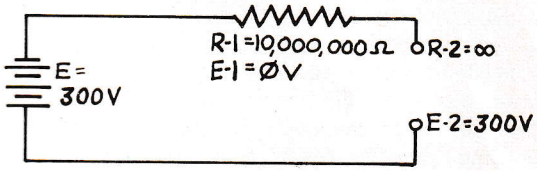
Again we have a 5-volt drop across each resistor. And since we've already learned that even with resistances well below one megohm the basic voltmeter and multimeter are both completely useless, we will consider only the VTVM.

Connecting the VTVM across R-1 now results in a combination resistance of $\frac{50,000,000 \times 11,000,000}{50,000,000 + 11,000,000} = \frac{550,000,000,000,000}{61,000,000}$ = 9,016,393Ω. The combination will thus drop $\frac{9,016,393}{59,016,393}$ of the battery voltage, or 1.53 volts, showing that even our VTVM is hopelessly outclassed in the high-megohm range.

How not to shock your friends

What all of this proves, obviously, is that the several types of volt meter we use in our day-to-day work can generally be depended upon for reliable measurements provided we understand their limitations and do not ask them to perform beyond those limitations. Conversely, even the best of them fails when its limitations are exceeded.

So now let's try just one more measurement. . .one which will let you know just how well you've followed what we've been trying to explain.



Your final circuit (above) shows a 300-volt battery connected to an open-circuited configuration composed of a 10-megohm resistor and two metal plates, separated by several inches of air. Calculations show that all 300 volts of battery energy are dropped across the infinite resistance (air) between the metal plates, with none being dropped across R-1.

So far so good. Now, assume that the resistance between any two points on your body is 200,000Ω. Would you be willing to touch both plates simultaneously? If your answer is "yes" you're right on the money. But if it was "no" there's something you missed!

Consider. Immediately before touching the plates there is a potential of 300 volts between them. But when you touch the plates you immediately load the open circuit (infinite resistance) between the plates, changing the open to a resistance of 200,000 ohms. Instantly this drops the voltage to $\frac{200,000 \times 300}{10,200,000}$ volts leaving as the total available to shock you a puny 5.88 volts!

But you say that leaves 294.12 volts unaccounted for? Not so. It's dropped across R-1 as long as you're touching those plates!

TWO WAYS TO MAKE PREP OF MINES MARK 27 EASIER

WHEN the men in the fleet meet a problem and not only Rudminde it, but sometimes send a first-class solution right along with it, it's great. A case in point is a pair of solutions to problems encountered in assembling Mk 27 mines with Mine Vehicles Mark 1 Mods 1 and 2, worked out by two of Navy No. 3923's finest.

Home-made test set

Difficulty in performing continuity and resistance tests on the impeller cable, due to the location of the amphenol receptacles in the nose section of the mine vehicles, caused Chief C. E. Hunt to come up with a test set which, used in conjunction with a megger, does the job easier, faster, and better.

What Chief Hunt used to make his test set can be found or cannibalized around most mine shops: two lamp sockets, a six-volt dry cell, one SPST switch, one DPST switch, four phone jacks (you could substitute studs), two amphenol (AN) connectors, and an alligator clip. The amphenols are type P-40 for connection to Mods 2 and 3, and type J-105 for Mods 4 and 5 of Mines Mk 27. These are the same as the amphenols used to connect the mine's war-battery section to the impeller switch in the nose section in the course of mine assembly.

A cable fitted with a plug to mate with the jacks on one end, and on the other end a connection compatible with that needed for the megger you intend to use with the home-made set, is also required.

The box can be designed, and the components arranged according to the desires of the creator — with an eye to materials available. Hunt's set is pictured on page 13 and his schematic is below.

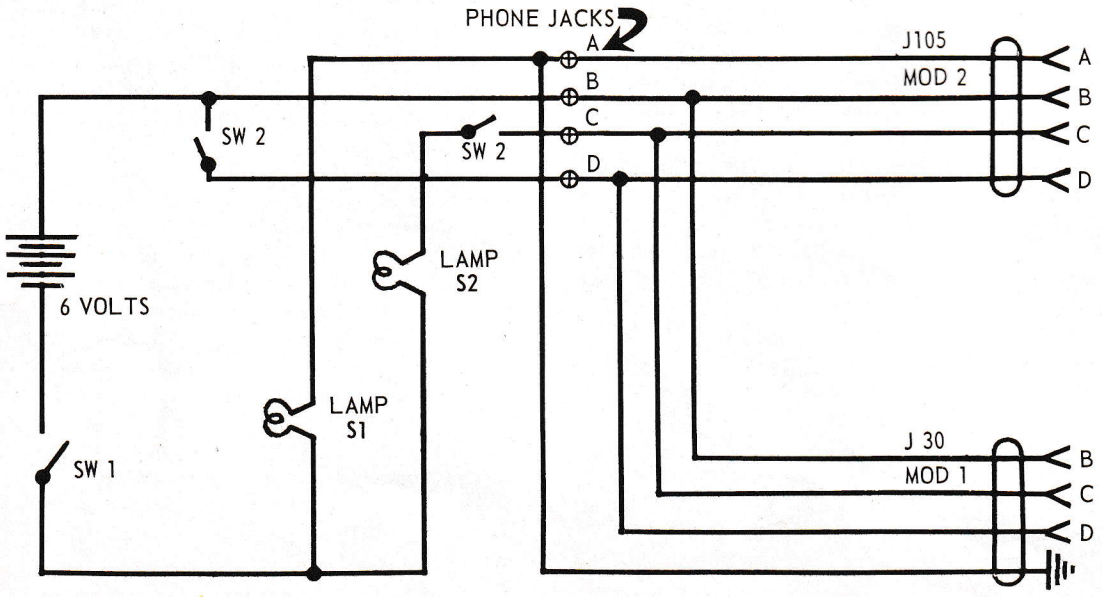
The chief modestly says "I'm certain the circuitry of the set can be improved, but it is simple enough to be made locally and prevents a misreading of the impeller cable."

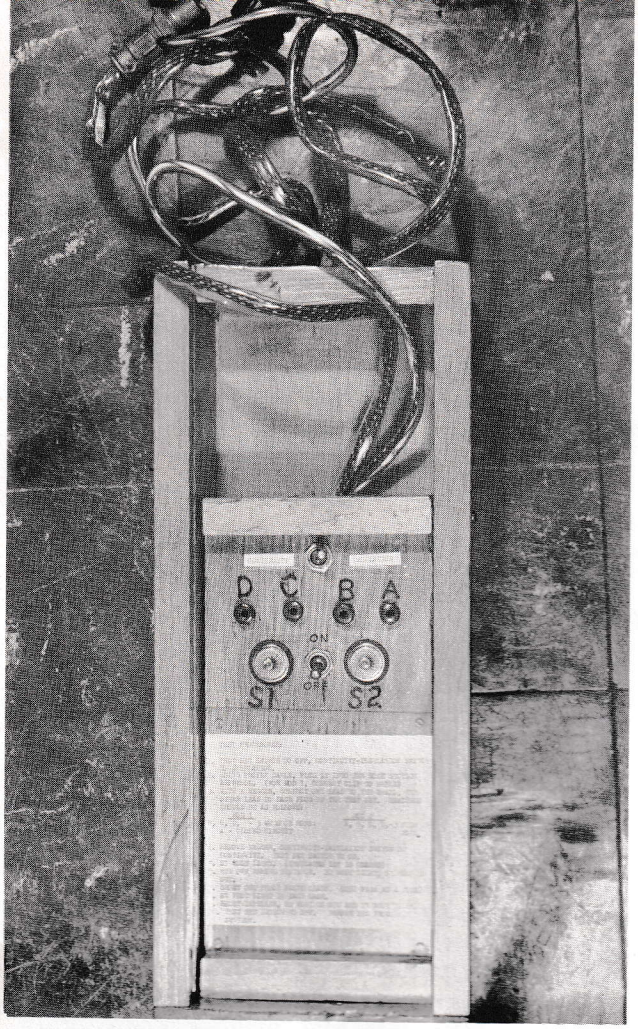
The test procedure, which you can use on your test set, is as follows:

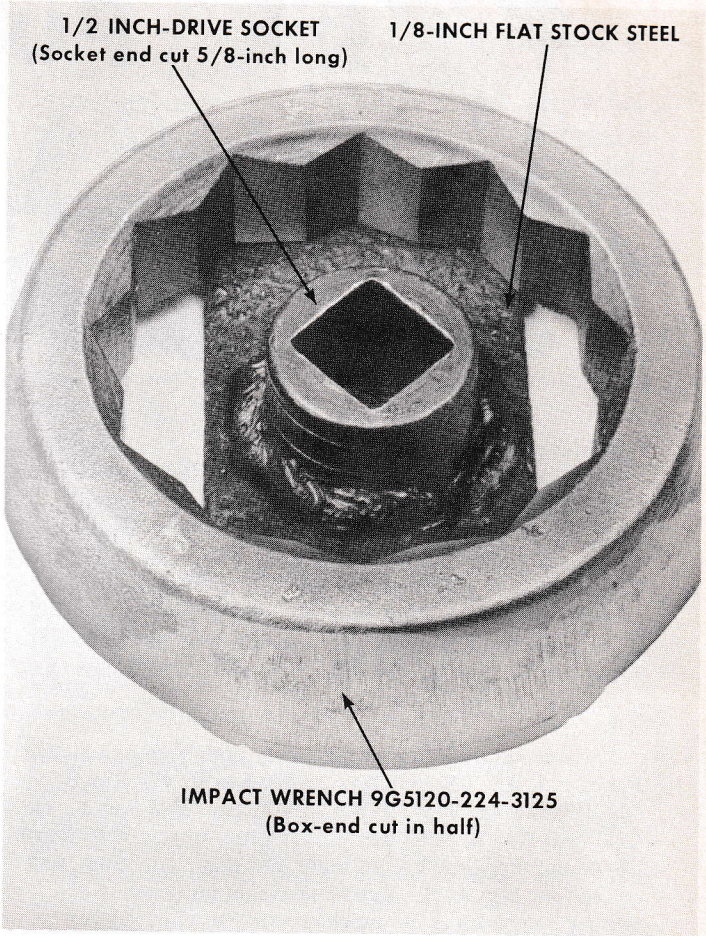
1. Turn set's on/off switch OFF and its continuity/insulation switch to INSULATION.
2. In nose section of mine vehicle, connect the set's cable for whichever mod of the vehicle you are testing, to the amphenol of the mine's impeller cable. (For Vehicle Mod 1 also ground alligator clip to the vehicle.)
3. Ground one megger lead to the vehicle and connect the megger's other lead to each phone plug (in turn) on the test set. Readings should be:

Vehicle Mod 1	Vehicle Mod 2
A – closed circuit	A, B, C, D each 3 megs
B, C, D each 3 megs or more	or more

4. Disconnect megger. Throw continuity/insulation switch to CONTINUITY, and throw the set's on/off switch to ON. S-1 must light indicating impeller's SW-1 (IS-1) is closed.
5. Run off arming distance: test set's S-2 must light and S-1 must go out.
6. Short circuit the flood valve leads, one pair at a time: set's S-1 must light in each case.
7. Reset impeller: set's S-2 must go out and S-1 must light.
8. Throw set's on/off switch OFF and disconnect set from the mine vehicle.







A better wrench

P. K. Beckwith's problem was skinned knuckles suffered during the awkward, blind, and sometimes costly removal of flood-valve adapters in both Mk 1 vehicles. As he explains it, the wrench provided in the tool kit for this purpose (it's DWG 424457) is too big, and you sometimes have to work it inside the mine from the outside, through hand holes, by feel. For a better deal, he says:

▶ Take an impact wrench 9G5120-224-3125 (cost $3.10) and cut off the handle. Then slice the box end of the wrench in half with a hacksaw. You end up with two halves 5/8" thick, which is the depth you need.

▶ Next cut a 5/8-inch 1/2-inch-drive socket at the socket end so it is 5/8-inch long. Weld this, drive-end-up, to a piece of 1/8" flat stock steel long enough to span the split impact wrench.

▶ Weld the plate to the wrench so that the center of the drive coincides with the center of the box opening of your split half of the impact wrench.

▶ Cut and grind off excess metal for a smooth job and the result should appear as shown here. Now you have what Beckwith calls the ideal flood-valve-adapter remover. To use, remove the shipping plug from the flood valve's location, detach the leads from it and push them back into the well, then seat the wrench on the adapter (it will fit only one way) and then use an 8-inch-long 1/2-inch-drive extension with a ratchet and remove the adapter.

Using a ratchet wrench rather than a speed wrench lets freed adapters be removed from the battery sections with minimum difficulty. It also lets the handle of the ratchet extend out through the second hand-hole forward of the bulkhead, where you can see what you're doing.

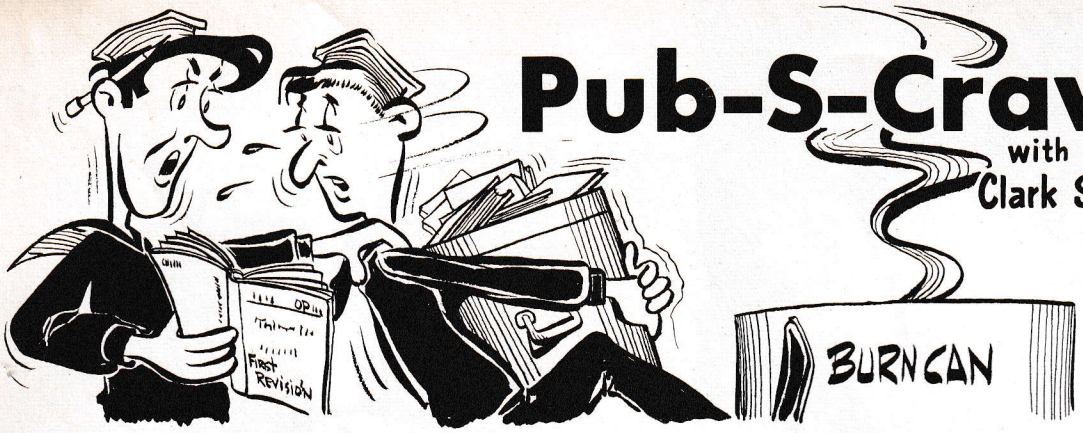
Do it yourself

The gear we've described is good and our hats are off to the men who made it. But that doesn't mean that either gadget will show up in the supply system. It's too bad. But here's why:

▶ The cost of preparing manufacturing documentation, of procurement, and of introducing them into the Mk 27's documentation (LDs, DWGs, OPs, ODs, etc., etc. would be prohibitive considering the fact that the 27s are one of our "older" mines, when –

▶ The jobs can be done by existing equipment. . .adequately if less expeditiously.

So the answer, men, is to make your own. We recommend it. We think you'll find both gadgets worthwhile to have, even though neither quite qualifies as being worthwhile at this time for BUWEPS procurement.



Pub-S-Crawlin'

with Clark Starter, MN2

Obsolete OPs, almost!

More than a few statements in Rudmindes – and in some scrambled-egg-type correspondence as well – make it clear that readers who have bothered at all to read the Foreword in Part 1, Vol 1 of the first revision to OP 2567 have ground to a screeching halt before reaching the second paragraph. The result: some are using older "firing-mechanism" manuals as bench-test instructions, while others have burned their copies of these older OPs.

So which group is right?

Neither!

The manuals we're talking about, both here and in that Foreword, are OPs 605 Rev 2, 670 Rev 0, 678 Rev 0, 681 Rev 1, 1799 Rev 1, 1844 Rev 1, and 1905 Rev 1, and ODs 7964 Rev 0, 9167 Rev 0, 9168 Rev 0, and 9169 Rev 0. These old standbys are on their last legs, it's true, and no one – at any level – should use them as sources of testing instructions for mechanisms for which newer testing instructions are to be found in OP 2567. Let's all agree on that.

So why not dispose of those older books? As testing instructions, you can. But in the Foreword to OP 2567 we've suggested you not destroy them. . .because the operational explanations in 2567 are largely introductions for neophytes, and the "schematics" are mostly block diagrams and cartoons.

Now we see nothing wrong with that. Anybody in this business who's not overblown with his own storehouse of engineering pratique will admit that neophytes are necessary, and that they need information they can understand. To this end the stuff in 2567 is needed, clever, and good . . .leaving only the question of whether that manual, which is the bench-testing bible for technicians at the depot level, is the place for their indoctrination.

But that's water over the dam. Not only will further gripes fail to alter the situation, but we think that there will be no cause for gripes after Part II of OP 2567 makes the scene. This, we're told, will be strictly for the technically astute, complete with schematics in three and four colors – everything but 3-D!

When?

We don't know.

But meanwhile those who have been griping about the cartoons in 2567 have perfectly good schematics in the OPs listed above. That's why we told you in the 2567 Foreword – and are again telling you here – that you should use 2567 Part I for test instructions. . .but should keep those older manuals around for schematics etc. until you get 2567 Part II.

That's why we're temporarily keeping them in Cog-I stocks instead of declaring them obsolete.

▶ **OD 7338 Rev 1 (Mine Mk 6 Mod 14):** Remove and renumber Sheet No. 21 (containing Item 204.0 a through g) to read: 22A, then insert it between Sheet Nos. 22 and 23. Write in the following note after Item 204.0 g on Sheet 22A: Item 204.0 h through t continued on Sheet No. 22.

▶ **OP 669 Rev 2 (Depth Charge Mk 14 Mod 0):** On page 44, under Hydrostatic-Pressure Test, after step 3, add: NOTE: The detonator gun must retract until the contacts of the arming switch are opened sufficiently for the safety fork to engage the piston and lock the piston in a disarmed position.

On page 61, left column, in step 4, change the second sentence to read: Tag all which have not been tested by a shore station or tender within 12 months for exchange with a base or ammunition tender.

▶ **OP 747 Rev 2 (Depth Charge Mk 6 Mods 0, 1, & 2):** On page 15, just before "Section II", add new paragraph: Policy for Inspections and Tests. Boosters, booster-extenders, detonators, and pistols must be inspected or tested upon receipt by issuing activities, and again before issue for service use, if their tags indicate a lapse of more than six months since previous pre-issue inspections or tests. For instructions, see Section II of this chapter.

On page 29, left column, under "Inspection in Port", after the first sentence write: Upon making port, also check the test dates of all boosters, booster-extenders, detonators, and pistols carried aboard. Tag all which have not been tested by a shore station or tender within 12 months for exchange with a base or ammunition tender.

▶ **OP 866 Rev 3 (Depth Charge Mk 9 Mods 2, 3, & 4):** On page 13, just before "Section II", add new paragraph: Policy

for Inspections and Tests. Boosters, booster-extenders, detonators, and pistols must be inspected or tested upon receipt by issuing activities, and again before issue for service use, if their tags indicate a lapse of more than six months since previous pre-issue inspections or tests. For instructions, see Section II of this chapter.

On page 27, right column, under "Inspection in Port", after the first sentence write: Upon making port, also check the dates of all boosters, booster-extenders, detonators, and pistols carried aboard. Tag all which have not been tested by a shore station or tender within 12 months for exchange with a base or ammunition tender.

▶ **OP 956 Vol 1 Rev 3 (Mine Mk 25 Mod 0):** On page 26, under Assemblies 04, 06, 21, and 23, cross out paragraph 12d and write in: Open the clock's winding-stem cover; wind one turn, then remove key. In paragraph 12f, first sentence, cross out the word "extension." Delete paragraph 12g entirely. Cross out the note to paragraph 12h, then renumber 12h to read: 12g. Delete paragraph 12i entirely. Change paragraph 12j to read: Replace the safety collar, cotter pin, and plastic cover removed in step e. Then, renumber 12j to read: 12h.

On page 26, under Assemblies 05, 14, 22, and 24, in paragraph 12f, first sentence, cross out the word "extension."

On page 37, under SET UP THE TEST, in step 3a, cross out "or 298."

On page 55, paragraph 52f, to beginning of paragraph, write in: Set the sensitivity switch to the desired position.

On page 58, paragraph 63, in the first sentence, between the words "torque all" and "extender-well" insert: search coil-cover plate.

On page 62, paragraph 64_2s, to end of paragraph, write in: NOTE: If the filling hole cover or gasket prevents the fairing from seating properly on the mine, cut a circular slot in fairing large enough to eliminate condition.

▶ **OP 1736 Rev 2 (Mine Mk 39-0):** In figure 11, under call out "CIRCUIT BREAK MK 2 MOD 1", and in Items 14 and 15 in back of book, add: NOTE: The circuit break's setting plug belongs on side opposite from that shown.

On page 29, and in Item 25 in back of book, under "Test Set Mk 41 Mod 1 Connections", change paragraph 5 to read: Connect the CD-14 jumper plug (DWG 495722), supplied in the basic tool set for mines, into one of the CD-14 receptacles on the TB-24 Mod 1.

On page 31, and in Item 28 in back of book, under "Circuit Break Balance Test", change step 15 to read: If both readings recorded in steps 9 and 14 above are within 1.0 microamperes of each other and between 0.6 and 2.5 microamperes, the circuit break is balanced. Proceed to the Interlook Dead Period Test.

▶ **OP 1765 Vol 1 Rev 2 (Mine Mk 25-2):** On pages 24 and 25, also in Item 1 in back of book, in paragraphs 10_1f_1 and 10_2f_2, cross out the word "extension."

On page 41, paragraph 32b, cross out that portion which reads: "the white leads forward, and to the left,". And in Item 15 in back of book, in paragraph 32b, cross out that portion which reads: "and to the left."

On page 69, and in Item 40 – Part 4, after paragraph 67s add: NOTE: If the filling hole cover or gasket prevents the fairing from seating properly on the mine, cut a circular slot in fairing large enough to eliminate condition.

▶ **OP 1797 Vol 1 Rev 2 (Mine Mk 25-1):** On page 26, and in Item 1 in back of book, in paragraphs 12_1f_1 and 12_2f_2, cross out the word "extension."

On page 79, and in Item 30 – Part 2 Sheet 2 of 2, under "Assemblies 21, 22, 23, and 24", after paragraph 67_4S_4 add: NOTE: If the filling hole cover or gasket prevents the fairing from seating properly on the mine, cut a circular slot in fairing large enough to eliminate condition.

▶ **OP 1807 Vol 1 Rev 1 (Mine Mk 49-0):** On page 24, under "Assemblies 01 and 03", in step 1, cross out the "CAUTION" paragraph. Change step 2 to read: Open the clock's winding-stem cover, insert the key, wind ONE turn, then remove the key. In step 3, cross out the first sentence and change the second sentence to read: Perform a function test as follows:. Cross out steps 4 and 6, then re-number step 5 to read: 4, and step 7 to read: 5.

▶ **OP 1808 Vol 1 Rev 1 (Mine Mk 49-1):** On page iv, write the following note: NOTE – Pages 11 and 12 are missing from this book. Refer to Item 28 in the envelope in the back of the book for figures 7 and 8.

On page 43, and in Item 22 in back of book, under "Assemblies 02 and 04", change step 1 to read:

1. Remove ground strap and connect CA-23 to the SE-3 terminal strip as follows:
   a. Lead 1 to terminal Q of CD terminal strip.
   b. Lead 2 to terminal H of CD terminal strip.
   c. Lead 3 to terminal C of CD terminal strip.
   d. Lead 4 to terminal D of CD terminal strip.
   e. Leads 5 and 10 to terminal A of the S-3 terminal strip.
   f. Lead 6 to the screw from which the ground strap was removed.
   g. Lead 7 to terminal G of CD terminal strip.
   h. Lead 8 to terminal F of CD terminal strip.
   i. Lead 9 to terminal G1 of SE-3 terminal strip.

Cross out step 2 and re-number step 3 to read: 2. On page 50, under "Assemblies 02 and 04", in step 4, change first sentence to read: Disconnect either one of the two CD-12 leads (9 or 10) from terminals A or G on the SE-3, see figure 8 in Item 32. In Item 32, in back of book, change first sentence of step 4 to read: For Assemblies 02 and 04, disconnect either one of the two CD-12 leads (9 or 10) from terminal A or G on the SE-3, see figure 8.

▶ **OP 1809 Vol 1 Rev 1 (Mine Mk 49-2):** On page 34, and in Item 13 in back of book, in step 4, cross out "NavOrd Std Part 12-Z-7003-1090" and write in: DWG 1183119.

On page 43, right column, in the step beginning "During the test, . . .", change that portion of the last sentence

which reads "Test Set Mk 3 Mod 2" to read: Test Set Mk 2 Mod 3.

Volume 2 Rev 1 (Mine Mk 49-2): In Job Sheet B-6, under "MATERIALS," for "One Control Box Mk 13 Mod 1," change "J1350-038-5924" to read: 4T1350-038-5924. Also for "One clamp. . .," cross out "12-Z-7003-1090" and write in: DWG 1183119.

▶ **OP 1816 Vols 1 thru 7 Rev 2 (Air-Laid Drill Mines):** In volumes 1 thru 6 on page 8, and in volume 7 on page 12, change Item 27's stock number "GF5330-050-1221" to read: KZ5330-227-9483.

▶ **OP 1860 Vol 3 Rev 2, July '63 edition (Test Sets):** On page 49-15, paragraph 2, under "Meter M1 Accuracy Check", in the last sentence change 49 and 51 to read: 45 and 55.

On page 49-18, table 49-7 under "Resistor Value," change "0.3 ohms" and "0.6 ohms" to read: 0.1 ohms for all values. Also under "Meter M1 Indication" for last item in column, change "Less than 160" to read: Green.

On page 49-14, table 49-5 under "Description", cross out "A resistor 0.3 ohms ± 1 percent, any wattage" and "A resistor 0.6 ohms ± 1 percent any wattage", and write in: A resistor 0.1 ohm ± 1 percent, any wattage. Also, under "Stock Number", cross out "N5905-557-4674" and "N5905-279-9977", write in: N5905-615-3768.

On page 49-16 under "Continuity Test Circuit Check", paragraph 2, first sentence, change "0.3 ohm or the 0.6 ohm" to read: 0.1 ohm. And in the second sentence change 49-6 to read: 49-7.

▶ **OP 1935 Vol 1 Rev 1 (Mine Mk 27-2, 3):** On page 66, under "Battery Section", to end of step 12 add: and insure that the wiring connections on both sides of bulkhead agree with the terminal voltages as labeled in figure 89 page 124. On page 102, paragraph 4a under "Overhaul", change LD 109347 to read: LD 109237. On page 180 under "Special Tools and Workshop Equipment for Hydrostatic Test Set Assembly", change LD 109236 to read: LD 109237.

▶ **OP 2129 Rev 0 (Mine Mk 6-14):** On pages 13 and 14 under "Modification for Mooring Safety Device", paragraph 2, in first sentence, change "rear spacer block." to read: rear stool block. Change second sentence to read: Replace the left rear bracket with the new modified stool, place the modified stool and two brackets over the stool blocks and secure them together by installing case link securing bolts hand tight. In last sentence change "spacer blocks" to read: stool blocks, and change the first sentence in paragraph 3 to read: Place the stool blocks, modified stool, and two case-support brackets in their proper position (figure 11) and drop long (1/2" -13 x 3") securing bolts through the empty holes.

On page 14, figure 11, change callout "MODIFIED CASE SUPPORT BRACKET" to read: MODIFIED STOOL, and change "SPACER BLOCK" to read: STOOL BLOCK.

On page 15, figure 12, change caption to read: Case Support Bracket and Stool Block Assembly and change callout "SPACER" to read: STOOL.

▶ **OP 2363 Vol 1 Rev 0 (Mine Mk 27-4, 5):** On page 52, step 7, add new sentence: Make sure the electrical leads are marked and connected as shown in figure 10. Also make sure electrical studs are tight on both sides of bulkhead.

▶ **TROUBLESHOOTER 3-63:** On page 8, "Pub-S-Crawlin'" for "OP 1452 Rev 2 (Mine Accessories): On page 95, after. . .", in seventh and eighth lines change G and F to read: A and B.

▶ **TROUBLESHOOTER 4-63:** On page 2 under "DANGER ON YOUR TAFFRAIL?" change serial numbers 28281 and 28371 to read: 38281, 38371.

On page 6, right column under "Component" change "Pressure Detector Mark 2 Mod 0" to read: Pressure Detector Mark 1 Mod 0.

On page 9, under photo "Vision not super" change BA-203/Us to read: BA-205/Us.

On page 13, under "SUBMARINE-LAID MINES" for Mine Mk 49 Mod 2, Gen'l Requisites: change OD 7510 to read: OD 7570. Under "AIR-LAID MINES" for Mine Mk 36 Mod 1, Fire Mech: change OP 2657[a] to read: OP 2567[a].

On page 14 under "AIR-LAID MINES" for Mine Mk 52 change Mods 0 through 6 to read: Mods 1 through 6, and cross out "OD 9670 Rev 2 Ch 1 (Mod 0)[c]." In "FOOTNOTES" f change OP 1816 Vol 7 Ch 0 to read: OP 1816 Vol 7 Rev 2 Ch 0:.

On page 15 under "DEPTH CHARGES" for Depth Charge Mk 6 Mod 0, 1 & 2, Assembly: change I-0609-074-7000 to read: I-0609-074-7010. Under "GENERAL REFERENCES" change NOLR 1216 Rev 0 Ch 2 to read: NOLR 1216 Rev 0 Ch 4.

On page 16, under "GENERAL REFERENCES" change OP 0 Rev 32 Ch 6 to read: OP 0 Rev 33, and cross out Ch 6.

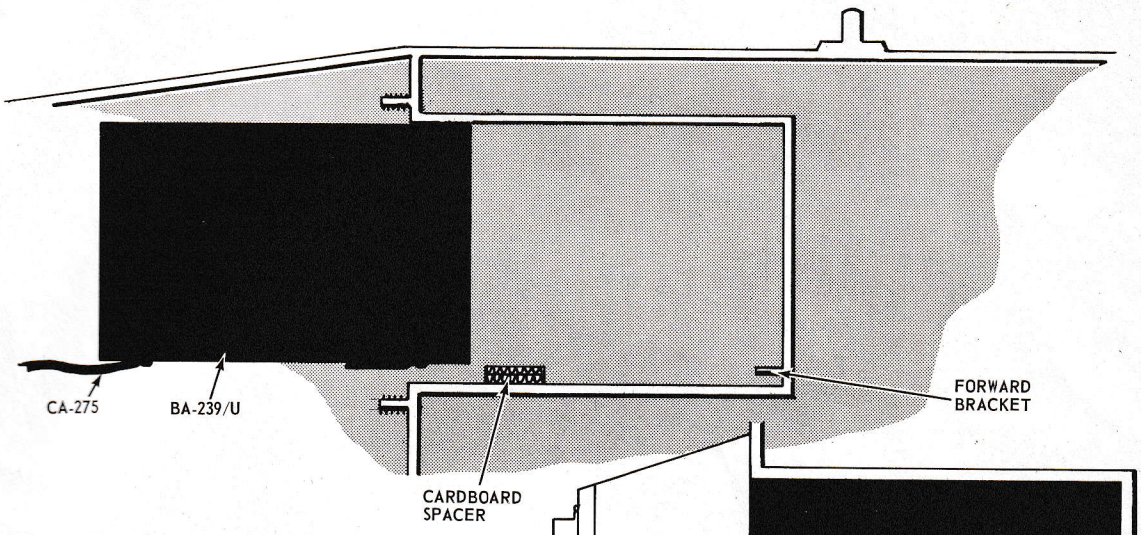
On page 18, "Pub-S-Crawlin'" for OP 2608 Vol 1 change (Mine Mk 52 Mods 0-6) to read: (Mine Mk 52 Mods 1-6). For OP 2974 Vol 1 change (Mine Mk 52 Mods 0-6) on pages 1-16, 1-18, 9-2, 9-19, 17-16, and 17-18 to read: (Mine Mk 52 Mods 1-6) pages 1-8, 1-10, 9-11, 17-12 and 17-21, and for OP 2974 Vol 2 change (Mine Mk 52 Mods 0-6) to read: (Mine Mk 52 Mods 1-6).

On page 19 under "BEFORE YOU CONNECT SD-4s. . .", first paragraph, fourth line, change and 29-1 to read: and 49-1.

▶ **TROUBLESHOOTER 1-64:** On page 4, left column, for "NOLR 1216" add: On page 149 in step 20 change 9.0 ± 1.6 to read: 9.0 ± 3.2; change 60.0 ± 8.0 to read: 57.0 ± 8.0; and change 118.0 ± 15.0 to read: 114.0 ± 13.5. Also, in step 25, third sentence, change 155 to read: 150. On page 150, in step 32, change 10 ± 0.5 to read: 11 ± 0.5.

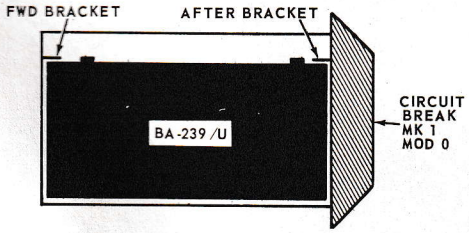
On page 6 for OP 1892 Vol 1 Rev 1 correct (Mine Mk 36-0) to read: (Mine Mk 36-3).

Do You do this Job Right?

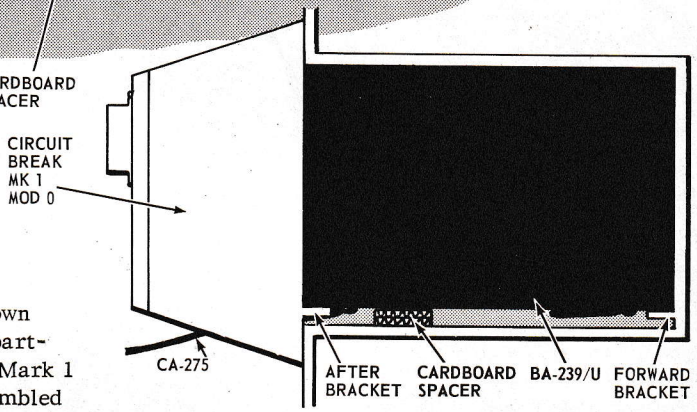


DAMAGED batteries BA-239/U discovered during routine inspection of some ready service condition Mines Mark 25 Mod 0 have prompted a second look at the way these batteries are installed.

In this mine there are two battery hold-down brackets, a forward one in the battery compartment and the after one on the Circuit Break Mark 1 Mod 0. And when the mines have been assembled with their suspension lugs at 30-inch spacing and in 12 o'clock position per figure 13 of OP 956 Vol 1, these brackets hold the batteries safe and allow about 5/8-inch free space at the top for terminals and leads. Like below:



So what's the trouble? It comes when the mines are assembled with their lugs on the opposite side of the case, at 14-inch spacing, and turned to 12 o'clock position. This way you have to install the batteries upside down, in which case gravity will cause the top of the batteries to bear against the top of the battery compartment. Like this, even if you're careful



to seat the BA-239s' forward ends over (rather than against) the forward hold-down bracket, the after bracket will crush the battery when you secure the circuit break to the battery compartment.

The fix comes from R.F. Stancik, MN2 at Navy 555:

▶ Cut cardboard spacers, 5-7/16 inches by 3 inches – enough of them to make up a thickness of 5/8 inch.

▶ Make sure you pass the forward ends of the batteries over (rather than against) the hold-down bracket when you slide them home in the compartment.

▶ Place spacers under the batteries' tops as shown, providing 5/8-inch clearance for the hold-down bracket on the circuit break.

▶ Lead the battery cable out through the slot in the circuit break and secure the circuit break per OP 956.

This way, thanks to Brother Stancik, the circuit break should push right into place smoothly and secure easily. If it doesn't. . .if you have to force it, stop! You've done something wrong. *the Editor*

NEXT MOVE...