RTMU-1 AND RTMU-2

TEST PROCEDURE

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1M-8.64—AINS.

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TITLE: RTMU-1 AND RTMU-2 TEST PROCEDURE

February 8, 1965

I. INTRODUCTION

1. The TMC Model RTMU- is a signal data, converter-storer unit used in the TMC TECHNIMATIC system of remote-control automatic tuning equipment.

The RTMU- contains two independently operating functional sections: the memory section and the readback section.

The programmed information fed into the memory section of the RTMU consists of sequential teletype characters in the standard 7.42 Baudot Code. The memory section acts upon the Serial character input, converts it to a parallel character output and stores this information. An associated Decoder is used to transfer the stored information to the Decoder on a demand basis.

The readback section functions as a continous check to the remote control center to indicate the exact position of controls on the equipment being programmed. A scanning circuit reads the biasing conditions on a diode matrix connected to rotary switches on the equipment being programmed. The resulting series of characters are shifted out of the RTMU- , in serial pulse form to be transmitted back to the remote control center. This scanning cycle is continuously repeated.

2. WARNINGS

1. DON'T INSERT OR REMOVE PC CARDS FROM BINS, UNTIL THE A-C POWER SWITCH IS TURNED OFF.

2. WHEN CONNECTING THE CABLES TO THE RTMU , THE A-C POWER SWITCH MUST BE TURNED OFF.

3. WHEN INSERTING CARDS, MAKE SURE THE CARDS ARE FIRMLY PLUGGED INTO THE CONNECTOR.

4. WHEN REMOVING CARDS, USE THE CARD EXTRACTOR ON THE BIN COVER. BE SURE THE CARD EXTRACTOR IS FIRMLY CLIPPED IN PLACE AFTER USE.

5. WHEN INSERTING PC CARDS, MODULES MUST FACE THE RIGHT SIDE PLATE.

6. REFER TO THE SCHEMATIC DIAGRAMS FOR ALL WAVEFORMS.

II. <u>EQUIPMENT REQUIRED</u>:

    1. Schematic diagrams CK-810, CK-880 CK-806 (4 Sheets 1-4 *RTMU-1*) CK1044 (4 Sheets 1-4 **RTMU-2**).

    2. Simpson 260 Multimeter or Equivalent.

    3. Electronic Counter - Hewlett Packard Model - 52451 or EQUIVALENT.

    4. Oscilloscope - TEKTRONIX Model - 541A, DUAL TRACE head OR EQUIVALENT.

    5. Three (3) Extender Cards PC129/A3696.

    6. "1-8" Jumper Wire (alligator clip one end and a probe on the other end).

    7. <u>UNITS REQUIRED</u>:

        1 - RTMU-1,2 (MEMORY)
        1 - RTTD-1   (DECODER)
        1 - RTPA-1   (PROGRAMMER)
        1 - RTKY-1   (TAPE READER)
        1 - HFSR-1   (SYNTHESIZER)
        1 - RTRS   (EQUIPMENT SELECTOR)

    8. <u>EQUIPMENT LAYOUT</u>:
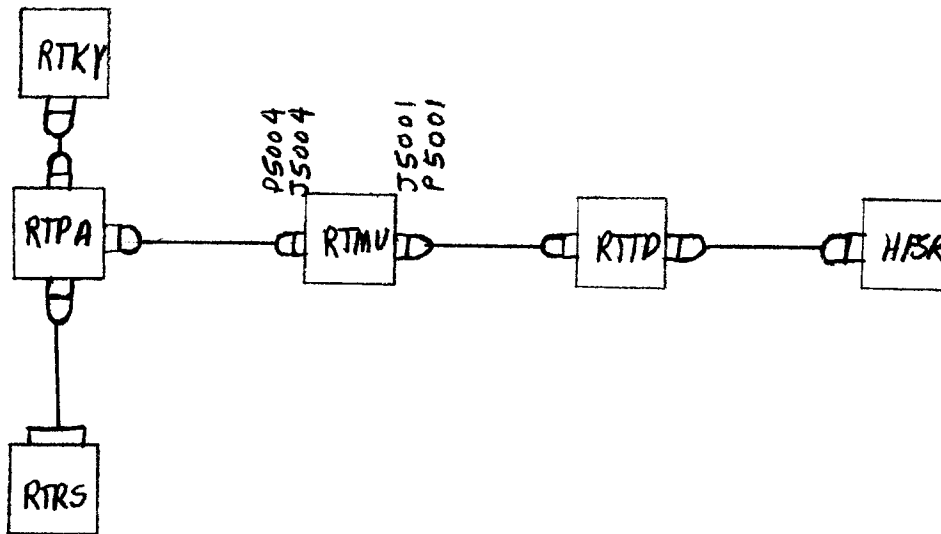
III. <u>MECHANICAL INSPECTION:</u>

1. Make sure the A-C line cord of the RTMU is disconnected.

2. Turn the A-C power switch to the OFF position.

3. Check to make sure the PC card receptacles are securely in place (lock washers should be on all receptacles).

4. Check to make sure there are no mechanical defects in the receptacles.

5. Check to make sure there are no foreign objects (with the exception of the PC card keying pins) present in the accepting portion of the Receptacles.

6. Unfasten the four screws securing the bins in place. Pull the two bins out and make the following check.

    (a) Make sure the Pins in the connectors are securely in place.

    (b) Check to see that all of the wires are connected. After the above has been completed, replace the bins and secure them in place.

7. If all steps have been completed and are OK, place a check mark in the space provided on the Test Data Sheet, Page 31 for MECHANICAL INSPECTION.

IV. PRELIMINARY ELECTRICAL INSPECTION:

A. (SEE NOTE - 1) Perform the following continuity test using the Simpson 260 multimeter (meter common connected to Chassis).

FUSE	METER	READING	METER	READING
AC	(SEE NOTE -#2) Line Side of Fuse	INFINATE		Infinate
+12	+DC	200 OHMS	-DC	25 OHMS
-12	-DC	500 OHMS	+DC	25 OHMS
+40	+DC	1200 OHMS	-DC	8 OHMS
-40	-DC	3000 OHMS	+DC	40 OHMS
-18	-DC	500 OHMS	+DC	35 OHMS

B. Before connecting the A-C power cord, make sure no cards are plugged into the bins.

C. Connect the A-C power cord to the RTMU.

D. Turn the A-C power switch to ON.

E. (SEE NOTE -#1) Perform the following voltage checks as indicated below using the Simpson 260 multimeter. (Set meter to read A-C Scale for 250 Volts). (D.C. Volts, 50 V. Scale, polarity as required).

FUSE	MEASUREMENTS FROM	MEASUREMENTS TO	VOLTAGE READING
+12	(SEE NOTE -#2) Line Side Of Fuse	GROUND	+12VDC to +13V DC
-12	"	"	-12VDC to -13V DC
+40	"	"	37V DC to 40V DC
-40	"	"	-37V DC to -40V DC
-18	"	"	-21V DC to - 23V DC

NOTES:

1. Check OK on Test Data Sheet.

2. Furthest point from the Front Panel.

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F. (See Note #1) Make the following voltage checks on the connectors as listed in the table below using the Simpson multimeter 260. (DC Volts, 50 V scale, polarity as required).

CONNECTOR	+12V	-12V	-18V	-40V
J5007 thru J5015 and J5021	Pin 5	Pin 37	--	--
J5016 thru J5020	Pin 6	Pin 2	--	Pin 44
J5010	--	--	Pin 41	--
J5022	Pin 39	Pin 7	--	--
J5023 thru J5027	Pin 5	Pin 37	--	--

To meter the +40 volts go to the junction of R5031 and R5032.

G. If the above test is proven to be OK, proceed to the next section.

NOTES: 1. Check OK on Test Data Sheet.

RTMU

V.   PROCEDURE FOR MEMORY SECTION:

A.   PC127/A3694 INITIAL RESET CIRCUIT

1.   Insert extender card PC129/A3696 in Z5000 slot.

2.   Insert PC127/A3694 into the extender card (modules facing the right side plate).

3.   Set the AC power to ON and monitor the waveform at PC127/A3694 extender card, Pin 16. A voltage rise should be observed. Set the AC power to OFF.

4.   Set the AC power to ON and monitor the waveform at PC127/A3694 extender card, PIN 4. A positive pulse approximately 10 Volts above ground should be observed. Set the AC power to OFF.

5.   Repeat step A4 for a corresponding waveform at PINS 6. 14, 18, 24, 28, 40 and 42 of PC127/A3694 extender card.

6.   Repeat Step A4 for a corresponding waveform at the following points.

    (a)   PIN 12 of Z5001 (d)   PIN 42 of Z5004
    (b)   PIN 8 of Z5002 (e)   PIN 4 of Z5006
    (c)   PIN 30 of Z5003 (f)   PIN 20 of Z5014

7.   Set the AC power to OFF.

8.   Remove the extender card and insert the tested PC127/A3694 into Z5000 slot.

9.   Record test results in the space provided on the test data sheet PAGE-31 for PC127/A3694.

**B.   PC165/A3806   "SERIAL TO PARALLEL CLOCK CIRCUIT"
  PC220/A4295   "SERIAL TO PARALLEL CLOCK CIRCUIT" (RTMU-2)**

1.   Insert extender card PC129/A3696 in Z5001 slot.

2.   Insert PC165/A3806 into the extender card (PC220/A4295 FOR RTMU-2).

3.   Connect P5004 to J5004.

4.   Place the probe of the Hewlett Packard frequency counter at TP-6 (sensitivity set at 1 VOLTRMS) on PC165/A3806 and set the AC power to ON (PC220/A4295 for RTMU-2).

V. PROCEDURE FOR MEMORY SECTION: -Cont'd

5. Set Programmer (RTPA) power to ON (P1009) must be connected to J1009 on Rear of Prgrammer).

6. Set Programmer selector switch to MANUAL PROGRAM and depress the proper equipment button (RTRS) for the stunt card being used. The following items must be observed at PC165/A3806 (PC220/A429$ For RTMU-2).

(a) Scope monitor at TP-6 of PC165/A3806 (PC220/A4295 for RTMU-2) should show free-running clock frequency of Z4.

(b) Adjust the frequency of Z4 to 22m Sec by varying R-5 (R4 On PC220). Allow the RTMU unit to warm up for 15 minutes. The frequency of Z4 must be rechecked and reset to 22m Sec if necessary. Record on Test Data Sheet.

(c) Monitor the waveform at PC165/A3806 extender card PIN 36. A positive going pulse train should be observed at the same rate of Z4 (5u Sec. in pulse width). For PC220 a pulse train of 11m Sec will be observed.

(d) Monitor the waveform at PC165/A3806 (PC220/A4295 for RTMU-2) extender card PIN-6. A negative going pulse train should be observed at the same rate of Z4 (5u Sec. in pulse width).

7. Signal input lamp must light.

8. Set the AC power to OFF.

C. PC125/A3692 "SERIAL TO PARALLEL SHIFT REGISTER"
PC221/A4294 "SERIAL SHIFT REGISTER" (RTMU-2)
PC175/A3823 "ADVANCE PRIME TIMING CIRCUIT"

1. Insert extender card PC129/A3696 in Z5002 slot and insert PC125/A3692 into the extender card (PC221/A4294 for RTMU-2).

2. Insert extender card PC129/A3696 in Z5005 slot and insert PC175/A3823 into the extender card.

3. Set AC power to ON.

4. Set the Programmer selector switch to TAPE READER and set the PUNCH-READER switch to ON.

5. Insert Tape #1 (SEE PAGE 26) into the tape-reader and depr ss the TAPE READ push btoon.

6. The signal input lamp will go ON and OFF in Step with th incomming signal.

V.   PROCEDURE FOR MEMORY SECTION: - Cont'd

    7.   Monitor the waveform at TP-6 on PC165/A3806 (PC220/A4295 for RTMU-2). The waveform seen will be 6 cycles at a 22m Sec rate per cycle followed by a stop pulse of approximately 45m S c. Set the AC power to OFF. (STOP pulse length is determined by the programmer).

    8.   Remove the extender card from Z5001 and insert the tested PC165/A3806 into slot Z5001 (PC220/A4295 for RTMU-2).

    9.   Record test results in the space provided on the test data sheet PAGE 31 for PC165/A3806 (PC220/A4295 for RTMU-2). Set the AC power to ON.

    10.   Re-run Tape #1 (as per steps C4 and C5) and observe the following waveforms at the points indicated on PC125/A3692 extender card (PC221/A4294 for RTMU-2).

       (a)   Monitor at PIN 40 should show a negative going pulse, 22m Sec in pulse width.

       (b)   Monitor at PIN 42 should show a positive going pulse 5u Sec in pulse width.

       (c)   Monitor at PINS 10, 16, 28 and 36 should be the same as monitor at PIN 42 (STEP C9b above) but displaced in time at 22m Sec from each other in the order mentioned. This should be proved by use of the dual trace feature of the scope.

    11.   Re-run Tape #1 (as per steps C4 and C5) and observe the following waveforms at the points indicated on PC175/A3823 extender card.

       (a)   Monitor at PIN 12 should show a negative going pulse 5u Sec in pulse width.

       (b)   Monitor at PINS 14, 34, and 38 should show a positive going pulse 7u Sec in pulse width.

       (c)   Monitor at PIN 42 should show a negative going pulse 500u Sec in pulse width.

V. PROCEDURE FOR MEMORY SECTION: - Cont'd

    12. Set the AC power to OFF and remove the PC125/A3692 extender card from Z5002 (PC221/A4294 for RTMU-2).

    13. Insert the tested PC125/A3692 into Z5002 slot and record test results in the space provided on the test data sheet PAGE 3ℓ for PC125/A3692. (PC221/A4294 for RTMU-2).

    14. Remove the PC175/A3823 extender card from Z5005 and insert the tested PC175/A3823 into Z5005 slot.

    15. Record the test results in the space provided on the test data sheet PAGE 3ℓ for PC175/A3823.

D. PC176/A3824 "ADVANCE "O" AND "E" CIRCUIT"

    1. Insert extender card PC129/A3696 in Z5008 slot and insert PC176/A3824 into the extender card.

    2. Set the AC power to ON and re-run Tape #1 (as per steps C4 and C5). Observe the following waveforms at the points indicated on PC176/A3824 extender card.

    (a) Monitor at PIN 22 should show a negative going pulse, 7u Sec in pulse width.

      b. Monitor at pins 36 and 42 should show a positive
         pulse (+40V), 1uSec in pulse width.

   3. Set the AC power to OFF and remove the extender card from Z5008.

   4. Insert the tested PC176/A3824 into Z5008 slot and record the
      test results in the space provided on the test data sheet
      PAGE __31__ for PC176/A3824.

E. PC173/A3821   "PRIME CIRCUIT"

   1. Insert extender card PC129/A3696 in Z5007 slot and insert
      PC173/A3821 into extender card.

   2. Set the AC power to ON and re-run tape #1 (as per steps C4 and C5).

   3. Monitor the waveforms at PC173/A3821 extender card pins 18, 20,
      22, 24 and 26. Two, positive pulses 150uSec in pulse width
      separated by 800uSec should be observed in each case.

   4. Set the AC power to OFF and remove the extender card from Z5007.

   5. Insert the tested PC173/A3821 into Z5007 slot and record the
      test results in the space provided on the test data sheet PAGE 31
      for PC173/A3821.

F. PC171/A3820   "MEMORY CORE INPUT SHIFT REGISTER"

   1. Insert extender card PC129/A3696 in Z5006 slot and insert
      PC171/A3820 into extender card.

   2. Set the AC power to ON and re-run tape #1 (as per steps C4 and C5).
      Observe the following waveforms at the points indicated on
      PC171/A3820 extender card.

      a. Monitor at pins 14, 20, 22, 34 and 38 should show
         negative going pulses decreasing in pulse width in the
         order given. This should be proved by use of the dual
         trace feature of the scope.

      b. Monitor at pins 7, 11, 17, 26 and 36 should show positive
         going pulses identical to the above wave forms (Step F2a)
         in pulse width and in the order given.

   3. Set the AC power to OFF.

G. PC 218/A4254   DOUBLE CHARACTER STUNTING CIRCUIT (RTMU-2)
   PC 170/A3813-1 "J" STUNTING CIRCUIT
   PC 191/A3813-2 "S" STUNTING CIRCUIT

There are various stunting cards available which may be used in the RTMU. PC-218 is the standard stunting card. Two coded characters must be identified by this card before the memory unit will re-act to a particular input. Cards PC-170 (REC #1) and PC-191 (REC #2) are the exceptions which are used for single or two receiver operation only. It must be kept in mind that whichever card is used th appropriate select code must preceed any transmission.

1. Insert extender card PC 129/A3696 in slot Z5003 and insert PC 218/A4254 into the extender card.

2. Place scope probe at TP-3 and set the A-C power to ON.

3. Set the Programmer selector switch to MANUAL PROGRAM and depress the proper equipment selection "letters" push button (A,B,C, etc.) which agrees with the proper stunt card being used. The waveform monitored at TP-3 must go negative and stay there.

4. Depress the proper equipment selection "numbers" push button (1,2,3, etc.) which agrees with the proper stunt card being us d. Observe the following items:

   a. The waveform monitored at TP-3 must go to "0" level.

   b. The output waveform at PC218/A4254 extender card PIN 26 should go negative and stay there.

   c. K-1 on PC218/A4254 must operate.

5. Depress the TUNE button and observe the following items:

   a. The output waveform monitored at PC218/A4254 extender card PIN 26 should go to "0".

   b. K-1 on PC218/A4254 must de-energize.

   c. Monitor TP-1 on PC171/A3820 with the scope. The waveform monitored must show the register shift multivibrator Z2, free running at a 8m Sec rate.

   d. Plac scop probe at the PC171/A3820 extend r card PIN 41. The wavef rm observed must be a negative puls train at the same rate of the regist r shift multivibrator (Z2).

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6. Set the AC power to OFF and ground PIN 34 of the PC218/A4254 extender card by use of the clip lead.

7. Set the AC power to ON and repeat Step G3 observing the following items:

   a. The waveform monitored at TP-3 must remain at "0".

   b. K-1 on PC218/A4254 must not operate.

8. Set The AC power to OFF, remove the clip lead ground and r mov the PC218/A4254 extender card from Z5003.

9. Insert the tested PC218/A4254 into Z5003 slot and record the test results in the space provided on the test data sheet, PAGE 31 for PC218/A4254.

10. Substitute PC170/A3813-1 and PC191/A3813-2 for PC218/A4254 in steps G1 thru G9 if required with the following changes;

    a. Delete steps G2, and G4.

    b. Change step G3 to read.
       Set the Programmer selector switch to MANUAL PROGRAM and depress REC-1 push button for PC170/A3813-1 or REC-2 push button for PC191/A3813-2.

       1. The output waveform monitored at PC170/A3813-1 or PC191/A3813-2 extender card PIN 26 should go negative and stay there.

       2. K-1 on PC170/A3813-1 or PC191/A3813-2 must operate.

    c. Step G7a must be modified to read:
       The output waveform at PC170/A3813-1 or PC191/A3813-2 extender card PIN 26 must remain at "0" level.

11. Set the AC power to ON and re-run tape #1 (as per steps C4 and C5).

12. Monitor the core set input pulses on PC171/A3820 extender card at PINs 15, 16, 18, 28 and 32. A negative going pulse 7u Sec in pulse width must be observed at each point.

13. Set the AC power to OFF.

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H.   PC169/A3812   "ADVANCE, TUNE COMPLETE AND BOY RELAY CIRCUIT"

1. Insert extender card PC 129/A3696 in slot Z5004 and insert PC 169/A3812 into the extender card.

2. Connect P5001 to J5001 and set the AC power to ON. Set the decoder power switch to ON.

3. Monitor TP-1 on PC 171/A3820 with the scope.

4. Repeat steps G3 and G4, the following items must occur.

   a. Waveform monitored at TP-1 on PC171/A3820 must show the free running frequency of the register shift multivibrator, for a period of time not to exceed 500m Sec.

   b. The BOY relay in the decoder must operate which in turn must turn the decorder ON (the TUNE indicator will light).

5. After the decoder has been turned ON the following items must occur at PC 169/A3812.

   a. Waveform monitored at TP-9 must show a alternate "O" and negative level.

   b. Waveform monitored at PIN 38 of PC 169/A3812 extender card must go to a zero level as soon as the TUNE button is depressed.

   c. Waveform monitored at PC169/A3812 extender card pin 4 must show a negative going pulse in step with the positive rise of step H5a above (4m Sec.).

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    d. Waveform monitored at PC 169/A3812 extender card pin 39 must show a negative going pulse approximately 450m Sec. in pulse width.

    e. Waveform monitored at PC 169/A3812 extender card pin 22 must show a positive going pulse approximately 450m Sec).

6. Set the Decoder OFF. The waveform monitored at PC169/A3812 xtend r card PIN 38 must go to a negative level.

7. Set the RTMU AC power to OFF and remove the PC169/A3812 extend r card from Z5004.

8. Insert the tested PC 169/A3812 card into Z5004 slot and record the test results in the space provided on the test data sheet PAGE 31 for PC 169/A3812.

9. Remove the PC 171/A3820 extender card from Z5006 and insert the tested PC 171/A3820 into Z5006 slot.

10. Record the test results in the space provided on the test data sheet PAGE 31 for PC 171/A3820.

I. PC 182/A3639   "MEMORY CORE REGISTER"
    PC 158/A3800   "DRIVE CIRCUIT FOR DECODER INPUT RELAYS"

1. Insert a PC 182/A3639 into each of the slots from Z5009 thru Z5013.

2. Insert extender card PC 129/A3696 in slot Z5014 and insert PC158/A3800 into the extender card.

3. Set the AC power to on and run tape #2 (SEE PAGE 26) through the tape reader.

4. Monitor waveforms on PC158/A3800 at TP-4, TP-6 , TP-7 and TP-8 there must be a constant negative level in each case.

5. Monitor TP-5 on PC 158/A3800. There must be a positive going pulse which should appear 30 characters after the equipment select character.

6. Run tape #3 (SEE PAGE 26) through the tape reader.

7. Monitor waveforms on PC158/A3800 at TP-4 TP-5 , TP-7 and TP-8 . There must be a constant negative level in each case.

8. Monitor TP-6 on PC158/A3800. There must be a positive going pulse which should appear 30 characters after the equipment select character.

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9. Run tape #4 (SEE PAGE 26) through the tape reader.

10. Monitor waveforms on PC158/A3800 at TP4, TP 5 , TP 6 and TP 8. There must be a constant negative level in each case.

11. Monitor TP 7 on PC158/A3800. There must be a positive going pulse which should appear 30 characters after the equipment select character.

12. Run tape #5 (SEE PAGE 27) through the tape reader.

13. Monitor waveforms on PC158/A3800 at TP 5 , TP 6 , and TP 7 . There must be a constant negative level in each case.

14. Monitor waveforms on PC158/A3800 at TP4 and TP 8 . There must be a positive going pulse which should appear 30 characters after the equipment select character.

15. Set the AC power to OFF and remove the PC158/A3800 extender card from Z5014.

16. Insert the PC158/A3800 card into Z5014 slot and set the AC power to ON. Set the AC power in the decoder to on also.

17. Run tape #6 (SEE PAGE 27) through the tape reader, the Decoder will turn ON and the H.F.S. frequency controls should go to 2.2222 MCS.

18. Set the H.F.S. frequency controls to numbers other than 2.2222 MCS and re-run tape #6. The frequency of the H.F.S. should again indicate 2.2222 MCS.

19. Set the AC power to OFF and record on the test data sheet the **acceptance** of the five PC182/A3639 Memory Core Regist rs in the space provided on PAGE 31 .

20. Record the test results of the PC158/A3800 card in the space provided on PAGE 31 .

21. Record the final test result in the space provided on PAGE 31 for tape #6.

22. The memory section test is now completed.

VI. A. CARD PC 127/A3694 (INITIAL RESET)

1. Insert extender card (PC129/A3696) into card position Z5000 making sure the numbers on the extender card are in alignment with the numbers on the connector. Plug card PC 127/A3694 into the extender card (the modules should be facing the right side side plate).

2. Connect the scope probe to PIN 28 of Z5000.

3. Turn the AC power switch to ON and observe the following:

    a. Positive pulse.

    b. Pulse width of 500u Sec.

    c. Amplitude of 8-12 volts.

4. This pulse will occur only once. Therefore, in order to see another pulse it is necessary to turn the AC power switch OFF, wait ten seconds and set the AC power switch ON.

5. Turn the AC power switch OFF.

6. Disconnect the scope probe from PIN 28 of Z5000 and connect the scope probe to the following pins, repeating the same test procedure as indicated for PIN 28 of Z5000.

    a. PIN 40 of Z5020

    b. PIN 32 of Z5016

    c. PIN 40 of Z5000

    d. PIN 42 of Z5020

    e. PIN 32 of Z5017

    f. PIN 42 of Z5000

    g. PIN 42 of Z5018

7. Turn the AC power switch OFF.

8. If the abov t sts have prov n to be O.K., remove the sc pe prob . Remove PC 127/A3694 and th extender card from Z5000.

9. R place card PC 127/A3694 into Z5000

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10. Check off card on Test Data Sheet if OK.

11. Proceed to next card PC163/A3805.

B. PC163/A3805 "FREE RUNNING CLOCK"

1. Make sure the AC power switch is OFF.

2. Insert extender card into Z5015, making sure it is aligned correctly with the connector. Plug card PC163/A3805 into extender card.

3. Connect the scope probe to pin 36 of Z5015 and make the following scope adjustments:

   a. Set the Time Base Control at 5 milli seconds /cm.

   b. Set the vertical input voltage at 1/2 volt /cm.

4. Connect the counter to PIN 36 of Z5015 and make the following adjustments (NOTE: be sure to ground the scope and counter to the RTMU-

   a. Connect the Signal Input to AC. on counter.

   b. Sample Rate: Fast

   c. Sensitivity (Volts RMS): 1

   d. Time Base: 1 milli second

   e. Function: Period Average 10

5. Turn the AC power switch ON and allow 30 seconds for unit to warm up before proceeding to the next step.

6. In this step you will adjust R1 on PC163/A3805 for a 22.00 mil-sec. period + .02 mil-sec. tolerence on the counter. The wave shape seen on the scope should compare to the wave shape on CK810.

7. Turn the AC power switch to OFF.

8. Insert the extender card into Z5018 and then insert PC128/A3695 into the extender card.

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9. Disconnect the scope probe and counter from PIN 36 of Z5015 and reconnect the scope probe to pin 4 of Z5015.

10. Turn the AC power switch to ON. A positive going pulse 4uSec in pulse width should be observed.

11. Disconnect the scope probe from pin 4 of Z5015 and reconnect the probe to pin 14 of Z5015. A positive going pulse 4uSec in pulse width should be observed.

12. Disconnect scope probe from pin 14 of Z5015.

13. Turn the AC power switch to OFF.

14. Proceed to the next card leaving PC163/A3805 in the extender card.

C. PC128/A3695 "START AND STOP CLOCK"

1. Turn the AC power switch ON.

2. Connect the scope probe to PIN 36 of Z5015 and make the following scope adjustments:

   a. Position the Time Base Control at 20 milli second /cm.

   b. Position the Vertical Input Voltage at a 1/2 volt /cm.

   c. Position the Triggering Mode at AC .

   d. Position the Triggering Slope at Internal (-).

   e. Adjust the Stability and Triggering Level Control until the wave shape on the scope is stable. Then compare the wave form on the scope with the wave form ON PAGE 20, if they are the same, continue to the next step.

3. Turn the AC power switch OFF.

4. Disconnect the scope probe from pin 36 of Z5015. Remove card PC163/A3805 and extender card. Replace card PC163 into Z5015.

5. Indicate acceptance of PC163/A3805 by placing a check mark in the space provided on PAGE 32

6. Connect the scope probe to TP8 on PC128.

7. Re-adjust the scope as follows:

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    a. Position the Intensity control for maximum.

    b. Position the Triggering Mode for Automatic.

8. Turn the AC power switch ON.

9. Compare the pulse on the scope with the pulse on CK810. If the pulse proves to be the same continue to the next step.

10. Disconnect the scope probe from TP8 and reconnect the probe to TP6 of PC128.

11. Compare the pulse on the scope with the pulse on CK810 and also test the following points on PC128 for the same pulse: TP4, TP3, TP2, TP1,   , Pin 40, Pin 10, Pin 16, Pin 24 and Pin 26 (Pulse should be negative).

12. Compare the pulse on the scope with the pulse on CK810 for the following points: Pin 20, Pin 22, Pin 34, Pin 28 and Pin 32. (CONSTANT NEGATIVE LEVEL).

13. If all pulses prove to be satisfactory turn the AC power switch OFF.

14. Remove card PC128/A3695 and extender card. Replace card PC128 into Z5018.

15. If the above tests have proven to be OK, check the card off on the Test Data Sheet.

16. Proceed to next card.

D. PC122/A3689 1st SHIFT REGISTER

1. Insert extender card into Z5016 and plug card PC122 into extender card.

2. Connect the scope probe to pin 38 of Z5016 and adjust the Time Base Control on the scope for .2 seconds /cm sweep.

3. Turn the AC power switch ON.

4. Compare the pulse on the scope with the pulse on CK810. NOTE: pulse will occur only once, in order to see pulse again turn the AC power switch OFF and then ON again). Then check the following pins on Z5016 for the same pulse: 34, 42, 16, 18 and 26.
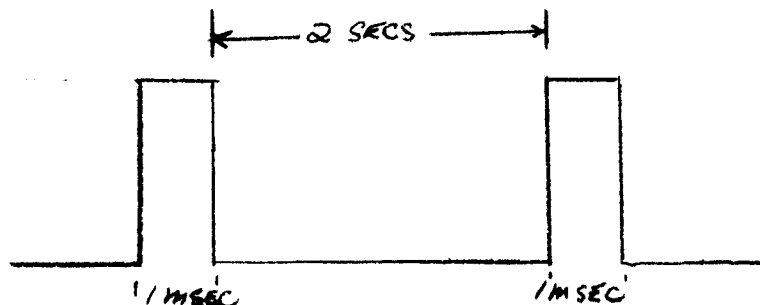
5. If all pulses prove to be satisfactory turn the AC power switch OFF.

6. Remove card PC122/A3689 and extender card. Replace PC122 into Z5016.

7. If the above tests have proven to be OK, check the card off on the Test Data Sheet.

8. Proceed to next card.

E. PC122/A3689 2nd SHIFT REGISTER

1. Insert extender card into Z5017 and plug card PC122/A3689 into extender card.

2. Connect the scope probe to pin 38 of Z5017. Turn the AC power switch to ON. Compare the pulse on the scope with the pulse on CK810 (NOTE: Pulse will occur only once; in order to see pulse again turn the AC power switch OFF and then ON again). Check the following pins on Z5017 for the same pulse: 34, 42, 18, 16, and 26.

3. If all pulses prove to be satisfactory turn the AC power switch OFF.

4. Proceed to the next card.

F. PC188/A3985 DC RESET CIRCUIT

1. Insert card PC188 into Z5020.

2. Connect the scope probe to pin 32 of Z5017. Adjust the Time Base Control on the scope to 1/2 second /cm.

3. Turn the AC power switch ON.

4. The pulse seen at this point should be a .5 milli second pulse and the time between pulses is 2 seconds (SEE ILLUSTRATION BELOW).

5. If the above test has proven to be OK, turn the AC power switch to OFF.

      (a) Remove the scope probe from PIN 32 of Z5017.

      (b) Remove card PC122 and extender card from Z5017.

      (c) Insert card PC122 into Z5017.

6. If the above tests have proven to be OK, indicate acceptance of PC122 on the test data sheet.

7. Indicate acceptance of PC188 on the Test Data Sheet and continu to the next card.

G. PC181/A3795 "RELAY OUTPUT CIRCUIT"

1. Insert card PC181 into Z5019.

2. Remove card PC128 from Z5018 and insert extender card into Z5018. Then plug card PC128 into extender card.

3. Connect the scope probe to TP6 on PC181.

4. Turn the AC power switch ON.

5. Make the following scope adjustments:

      (a) Set the Time Base Control to 20 milli seconds /cm.

      (b) Stabalize the triggering level of the scope and compare the pulse on the scope with Figure #1A and #1B. The pulse on the scope will vary between Figure #1A and #1B (PAGE - 29).

6. Connect one end of the jumper wire (clip end) to a common chassis ground. While observing the scope connect the probe end of the jumper wire to PIN 22 of Z5018. The pulse on the scope should compare to the pulse in Figure #1C. (This pulse will appear continuously).

7. Remove the probe end of the jumper wire from PIN 22 of Z5018. The pulse wave form should return to its normal state (Step 5B).

8. Connect the probe end of the jumper wire to PIN 20 of Z5018. The pulse on the scope should compare to the pulse in Figure #1D. (This pulse will appear continuously ie 11 out of 12 times).

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9.   Remove the probe end of the jumper wire from PIN 20 of Z5018. The pulse wave form should return to its normal state (Step #5B).

10.   Connect the probe end of the jumper wire to PIN 34 of Z5018. The pulse on the scope should compare to the pulse in Figure #1E (This pulse will appear continuously ie 11 out of 12 times).

11.   Remove the probe end of the jumper wire from PIN 34 of Z5018. The pulse wave form should return to its normal state (Step 5B).

12.   Connect the probe end of the jumper wire to PIN 28 of Z5018. The pulse on the scope should compare to the pulse in Figure #1F. (This pulse will appear continuously ie 11 out of 12 times).

13.   Remove the probe end of the jumper wire from PIN 28 of Z5018. The pulse wave form should return to its normal state (Step 5B).

14.   Connect the probe end of the jumper wire to PIN 32 of Z5018. The pulse on the scope should compare to the pulse in Figure #1G. (This pulse will appear continuously ie 11 out of 12 times).

15.   Remove the probe end of the jumper wire from PIN 32 of Z5018. Remove the scope probe from TP-6 on PC-181.

16.   Connect the scope probe to TP-5 of PC181.

17.   Make the following scope adjustment:

Stabalize the triggering level of the scope, and compare the pulse on the scope with Figure #2A and 2B. The pulse on the scope will vary between Figure #2A and #2B (PAGE - 30).

18.   Connect one end of the jumper wire (clip end) to a common chassis ground. While observing the scope connect the probe end of the jumper wire to PIN 22 of Z5018. The pulse on the scope should compare to the pulse in Figure #2C. (This pulse will appear continuously).

19. Remove the probe end of the jumper wire from pin 22 of Z5018.
The pulse wave form should return to its normal state (Step 18a).

20. Connect the probe end of the jumper wire to Pin 20 of Z5018.
The pulse on the scope should compare to the pulse in Figure 2D.
(This pulse will appear continuously ie 11 out of 12 times)

21. Remove the probe end of the jumper wire from Pin 20 of Z5018.
The pulse wave form should return to its normal state (Step 18a).

22. Connect the probe end of the jumper wire to Pin 34 of Z5018. The
pulse on the scope should compare to the pulse in Figure 2E.
(This pulse will appear continuously ie 11 out of 12 times).

23. Remove the probe end of the jumper wire from Pin 34 of Z5018. The
pulse wave form should return to its normal state (Step 18a).

24. Connect the probe end of the jumper wire to Pin 28 of Z5018. The
pulse on the scope should compare to the pulse in Figure 2F (This
pulse will appear continuously ie 11 out of 12 times).

25. Remove the probe end of the jumper wire from Pin 28 of Z5018. The
pulse wave form should return to its normal state (Step 18a).

26. Connect the probe end of the jumper wire to Pin 32 of Z5018. The
pulse on the scope should compare to the pulse in Figure 2G.
(This pulse will appear continuously ie 11 out of 12 times).

27. Check PC181 OFF on the test data sheet.

28. Turn the AC power OFF.

29. Remove card PC128 and extender card from Z5018 and then replace
PC128 into Z5018.

30. This is the end of the test procedure for the Readback Transmitter.
If all the steps check out to be OK than this unit is ready for
operation.

J. INSTRUCTIONS FOR PUNCHING TEST TAPES

1. TAPE #1:

   a. Set the Programmer selector switch to TAPE PUNCH.

   b. Set the PROGRAMMER POWER and PUNCH-READER POWER switches to ON.

   c. Depress the proper EQUIPMENT SELECT button for the stunt card used, REC #1 for PC170/A3813-1 and REC #2 for PC191/A3813-2).

   d. Depress the CH. A IFBW push-button.

   e. Advance the tape by depressing the tape feed button on the tape reader. This will result in a long series of identical characters being punched on the tape. Advance the tape until approximately 75 characters are punched on the tape.

   f. Depress the TUNE push-button, and advance the tape out of the tape reader.

2. TAPE #2:

   a. Repeat steps J-1-a,b and c.

   b. Depress the 0 KILOCYCLES push-button.

   c. Repeat Steps J-1-e and f.

3. TAPE #3:

   a. Repeat Steps J-1-a, b and c.

   b. Depress the 1 KILOCYCLES push-button.

   c. Repeat Steps J-1-a and b and c.

4. TAPE #4:

   a. Repeat Steps J-1-a, b and c.

   b. Depress the 2 KILOCYCLES push-button.

   c. Repeat Steps J-1-e and f.

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J. **INSTRUCTIONS FOR PUNCHING TEST TAPES - cont'd**

    5. TAPE #5:

        a. Repeat Steps J-1-a, b and c.

        b. Depress the MC/17-31 push-button.

        c. Repeat Steps J-1-e and f.

    6. TAPE #6:

        a. Repeat Steps J-1-a, b and c.

        b. Depress the MC/2-16 push-button.

        c. Depress the 2 MC push-button.

        d. Depress the 100 KC push-button.

        e. Depress the 2 KILOCYCLES push-button.

        f. Depress the 10 KC push-button.

        g. Depress the 2 KILOCYCLES push-button.

        h. Depress the 1 KC push-button.

        i. Depress the 2 KILOCYCLES push-button.

        j. Depress the .1 KC push-button.

        k. Depress the 2 KILOCYCLES push-button.

        l. Depress the TUNE push-button.

        m. Advance the tape out of the tape reader.

TMC FORM SPEC 1

172 MILISECONDS

-11 VOLTS
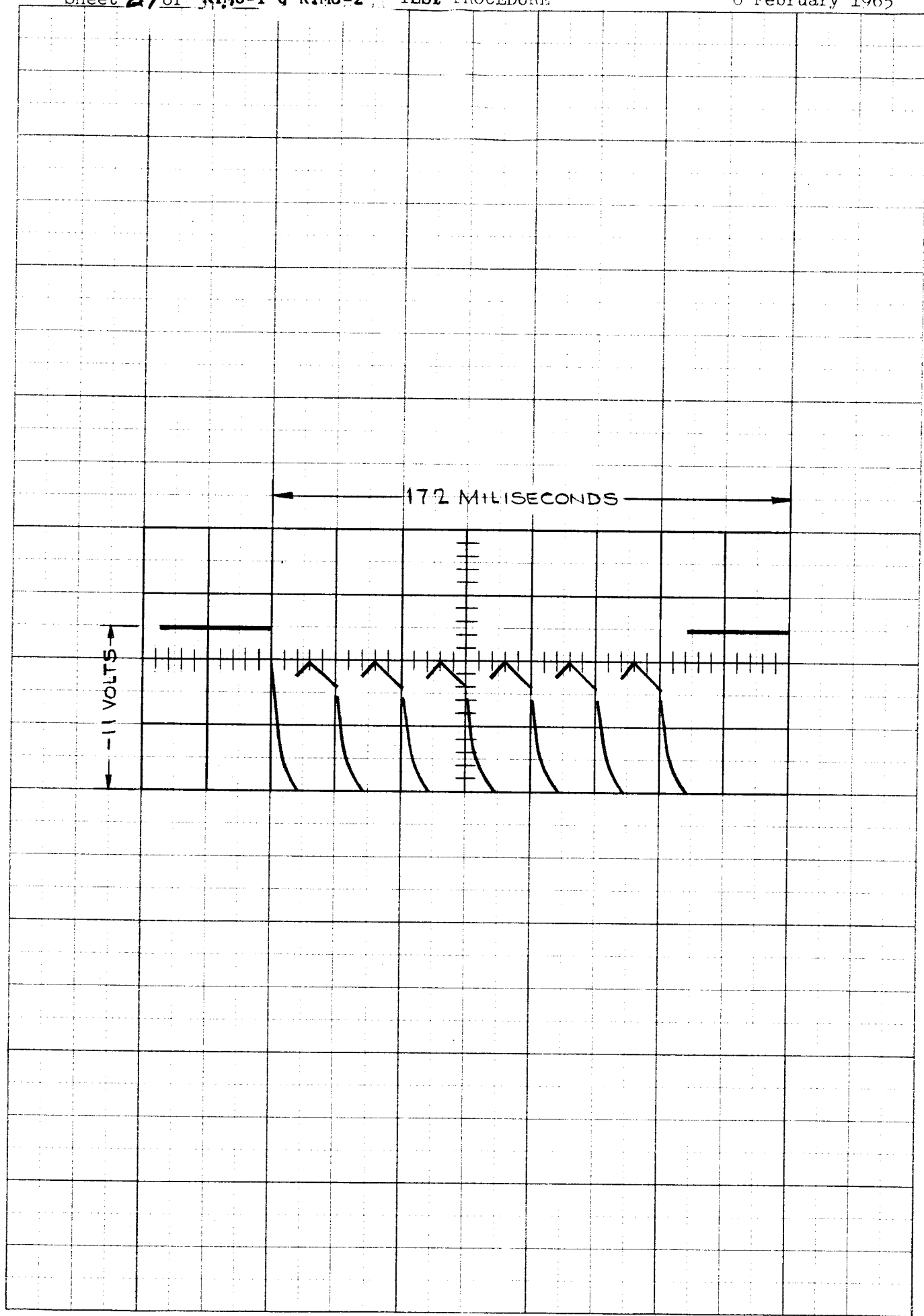
NL COMPILED	CHECKED	TITLE: RTMU-1 & RTMU-2 TEST PROCEDURE
APPROVED		SS
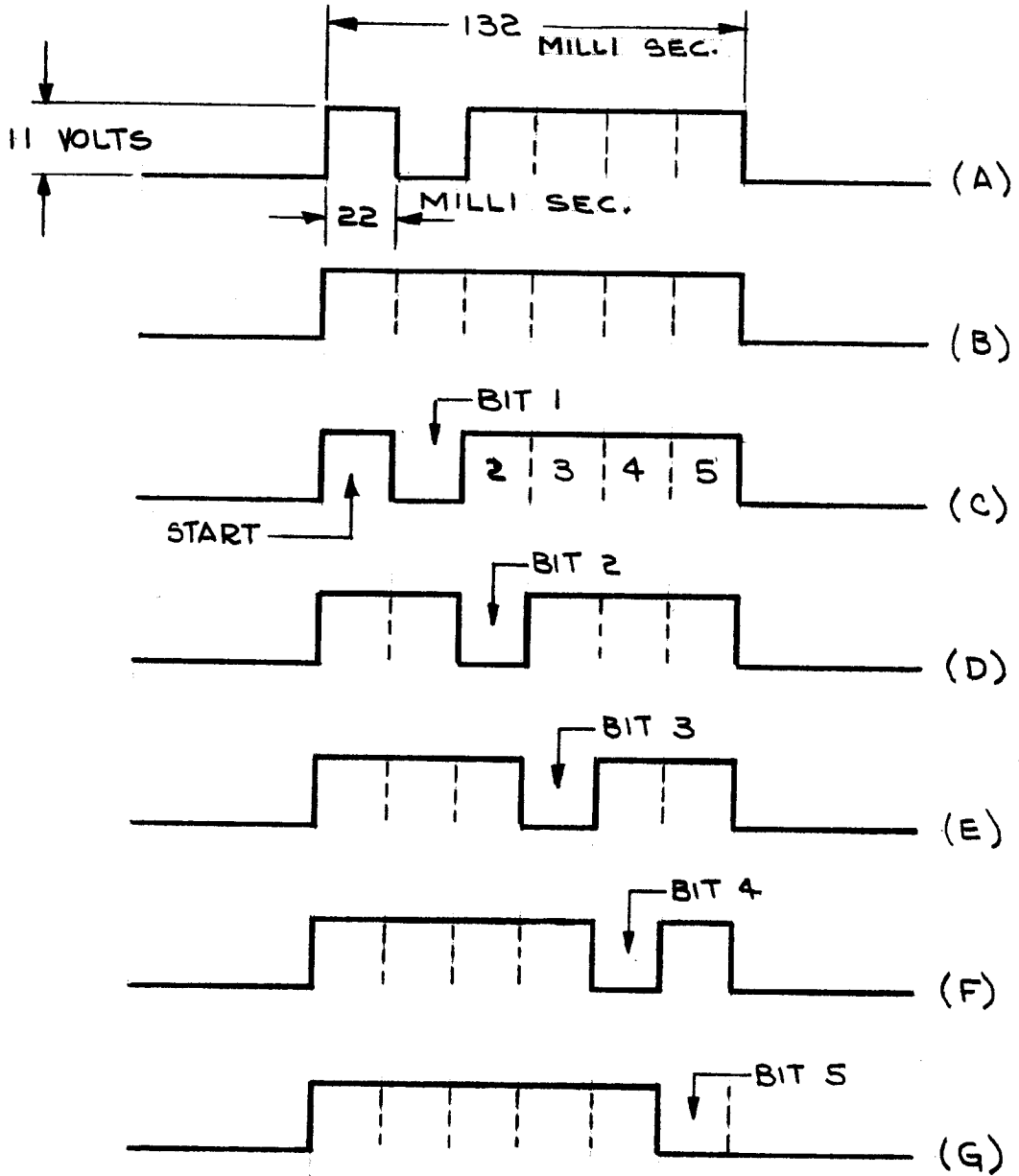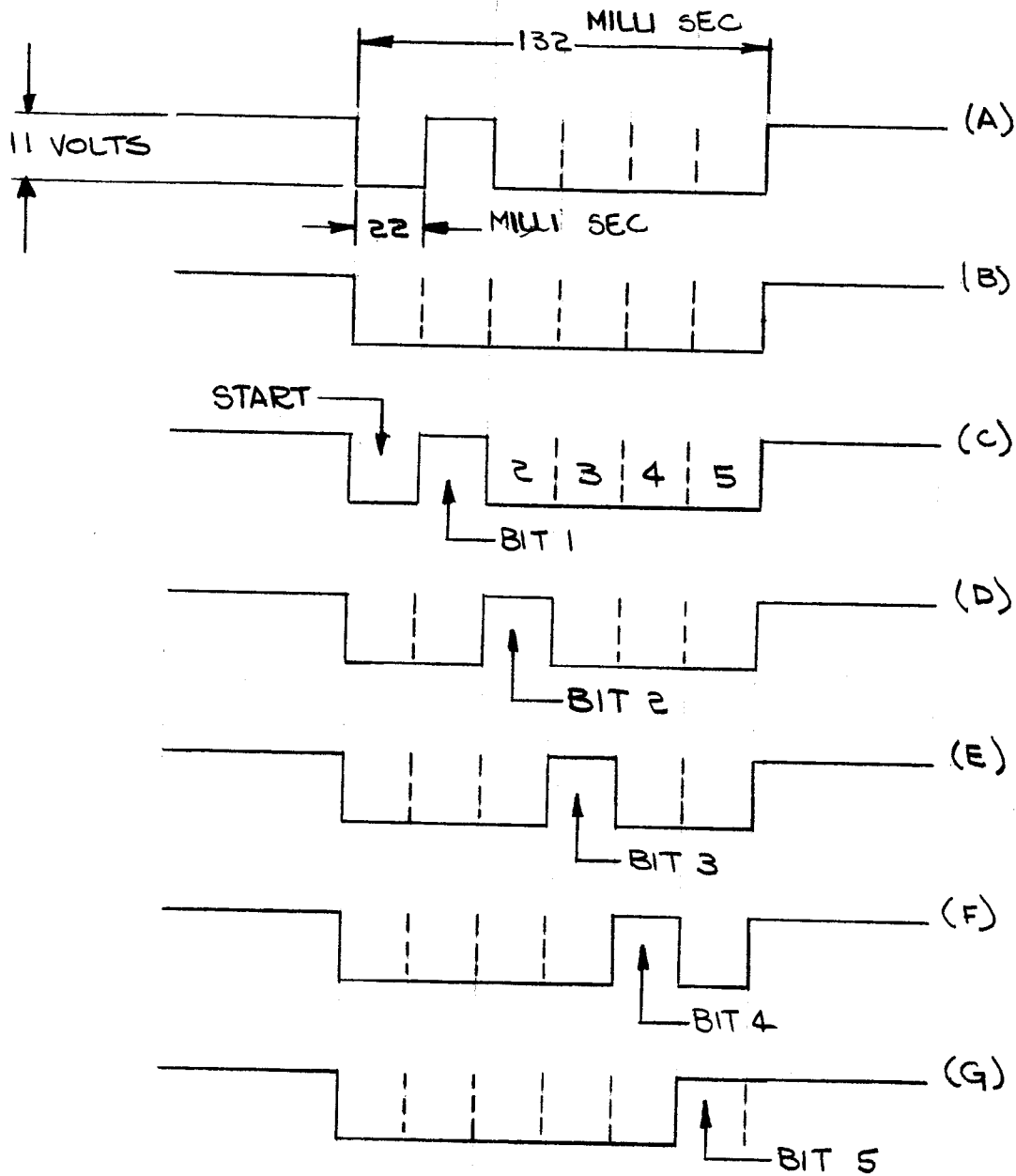
FIGURE #1 (TP6)

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TITLE: RTMU-1 & RTMU-2 TEST PROCEDURE

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FIGURE #2 (TP5)

VII - TEST DATA SHEET MEMORY SECTION

III. MECHANICAL INSPECTION --------------------------------- _____

(ACCEPT)

IV. PRELIMINARY ELECTRICAL INSPECTION.

PAGE	SECTION	OK
6	A	_____
6	E	_____
7	F	_____

_____

(ACCEPT)

V. PROCEDURE FOR MEMORY SECTION

PAGE	SECTION	CARDS	OK
8	A,9	PC127/A3694	
9	B,6,b	Z4 Set to	_____ MSEC
9	C.8	PC165/A3806	_____
10	C.9	PC220/A4295 RTMU-2	_____
11	C13	PC125/A3692	_____
11	C13	PC221/A4294 RTMU-2	_____
11	C15	PC175/A3823	_____
12	D,4	PC176/A3824	_____
12	E,5	PC173/A3821	_____
14	G9	PC218/A4254 RTMU-2	_____
14	G9	PC170/A3813-1	_____
14	G9	*PC191/A3813-2	_____
16	H,8	PC169/A3812	_____
16	H,10	PC171/A3820	_____
17	I,19	PC182/A3639	_____
17	I,19	PC182/A3639	_____
17	I,19	PC182/A3639	_____
17	I,19	PC182.A3639	_____
17	I,19	PC182/A3639	_____
17	I,20	PC158/A3800	_____
19	I,21	Final Test (HFSR-1 FREQUENCY)	_____ MCS. _____ OK

_____

(ACCEPT)

VII - TEST DATA SHEET READBACK SECTION

VI. PROCEDURE FOR READBACK SECTION

PAGE	SECTION	CARDS	OK
19	A10	PC127/A3694	
20	C5	PC163/A3805	_____
21	C15	PC128/A3695	_____
22	D7	PC122/A3689	_____
23	F6	PC122/A3689	_____
23	F7	PC188/A3985	_____
25	G27	PC181/A3795	_____
			_____

_____
(ACCEPT)

_____
(INSPECTED BY)

_____
(TESTED BY)

_____
(SERIAL #)

_____
(APPROVED BY)

REVISION SHEET				THE TECHNICAL MATERIEL CORP. MAMARONECK NEW YORK	S 923
					LIST NO.
DATE	REV.	SHEET	EMN #	DESCRIPTION	APP.
6/30/67	Ø			ORIGINAL RELEASE FOR PRODUCTION	
REVISION SHEET				THE TECHNICAL MATERIEL CORP. MAMARONECK NEW YORK	S 923
					LIST NO.
				DESCRIPTION	APP.
				ORIGINAL RELEASE FOR PRODUCTION	

TMC FORM MLR-1 2-65—AINS.