

DATA SYSTEMS TECHNICIAN 3 & 2, VOLUME 1

NAVEDTRA 10201-B1

Prepared by the Naval Education and Training Program Development
Center, Pensacola, Florida

Your NRCC contains a set of assignments and perforated answer sheets. The Rate Training Manual, Data Systems Technician 3&2, Vol. 1 NAVEDTRA 10201-B1, is your textbook for the NRCC. If an errata sheet comes with the NRCC, make all indicated changes or corrections. Do not change or correct the textbook or assignments in any other way.

HOW TO COMPLETE THIS COURSE SUCCESSFULLY

Study the textbook pages given at the beginning of each assignment before trying to answer the items. Pay attention to tables and illustrations as they contain a lot of information. Making your own drawings can help you understand the subject matter. Also, read the learning objectives that precede the sets of items. The learning objectives and items are based on the subject matter or study material in the textbook. The objectives tell you what you should be able to do by studying assigned textual material and answering the items.

At this point you should be ready to answer the items in the assignment. Read each item carefully. Select the BEST ANSWER for each item, consulting your textbook when necessary. Be sure to select the BEST ANSWER from the subject matter in the textbook. You may discuss difficult points in the course with others. However, the answer you select must be your own. Remove a perforated answer sheet from the back of this text, write in the proper assignment number, and enter your answer for each item.

Your NRCC will be administered by your command or, in the case of small commands, by the Naval Education and Training Program Development Center. No matter who administers your course you can complete it successfully by earning a 3.2 for each assignment. The unit breakdown of the course, if any, is shown later under Naval Reserve Retirement Credit.

WHEN YOUR COURSE IS ADMINISTERED BY LOCAL COMMAND

As soon as you have finished an assignment, submit the completed answer sheet to the officer

designated to grade it. The graded answer sheet will not be returned to you.

If you are completing this NRCC to become eligible to take the fleetwide advancement examination, follow a schedule that will enable you to complete all assignments in time. Your schedule should call for the completion of at least one assignment per month.

Although you complete the course successfully, the Naval Education and Training Program Development Center will not issue you a letter of satisfactory completion. Your command will make an entry in your service record, giving you credit for your work.

WHEN YOUR COURSE IS ADMINISTERED BY THE NAVAL EDUCATION AND TRAINING PROGRAM DEVELOPMENT CENTER

After finishing an assignment, go on to the next. Retain each completed answer sheet until you finish all the assignments in a unit (or in the course if it is not divided into units). Using the envelopes provided, mail your completed answer sheets to the Naval Education and Training Program Development Center where they will be graded and the score recorded. Make sure all blanks at the top of each answer sheet are filled in. Unless you furnish all the information required, it will be impossible to give you credit for your work. The graded answer sheets will not be returned.

The Naval Education and Training Program Development Center will issue a letter of satisfactory completion to certify successful completion of the course (or a creditable unit of the course). To receive a course-completion letter, follow the directions given on the course-completion form in the back of this NRCC.

You may keep the textbook and assignments for this course. Return them only in the event you disenroll from the course or otherwise fail to complete the course. Directions for returning the textbook and assignments are given on the book-return form in the back of this NRCC.

PREPARING FOR YOUR ADVANCEMENT EXAMINATION

Your examination for advancement is based on the Occupational Standards for your rating as found in the MANUAL OF NAVY ENLISTED MANPOWER AND PERSONNEL CLASSIFICATIONS AND OCCUPATIONAL STANDARDS (NAVPERS 18068). These Occupational Standards define the minimum tasks required of your rating. The sources of questions in your advancement examination are listed in the BIBLIOGRAPHY FOR ADVANCEMENT STUDY (NAVEDTRA 10052). For your convenience, the Occupational Standards and the sources of questions for your rating are combined in a single pamphlet for the series of examinations for each year. These OCCUPATIONAL STANDARDS AND BIBLIOGRAPHY SHEETS (called Bib Sheets), are available from your ESO. Since your textbook and NRCC are among the sources listed in the bibliography, be sure to study both as you take the course. The qualifications for your rating may have changed since your course and textbook were printed, so refer to the latest edition of the Bib Sheets.

NAVAL RESERVE RETIREMENT CREDIT

This course is evaluated at 15 Naval Reserve retirement points and will be credited in units upon satisfactory completion of the assignments as follows:

Unit	Points	Assignments
1	12	1 through 10
2	3	11 and 12

These points are creditable to personnel eligible to receive them under current directives governing retirement of Naval Reserve personnel.

COURSE OBJECTIVE

In completing this NRCC, you will demonstrate a knowledge of the subject matter by correctly answering items on the following:

Data Systems Technician rate including security, system coverage publications advancement, bibliography for advancement, and technical manuals

maintenance including soldering techniques, wire wrapping, tools, printed circuit board repair, identification of cards, troubleshooting, and cooling systems

test equipment including maintenance and safety on oscilloscopes, test probes, multimeters, frequency counters, and semiconductor testing devices

NTDS Unit Computer (CP-642B/USQ-20(V) including its characteristics, controls, instructions, bootstrap memory, input/output data, and use of functional schematics.

NTDS Peripheral Equipment including the following:

- RD-243 Magnetic Tape Unit
- RD-231 Paper Tape Cabinet
- OJ-212(V1) Teletypewriter
- C-3675A System Monitoring Panel
- MX-3195 Universal Keyset

magnetic storage including tape drives, disk files, drum units and core memories, terms, and troubleshooting

While working on this correspondence course, you may refer freely to the text. You may seek advice and instruction from others on problems arising in the course, but the solutions submitted must be the result of your own work and decisions. You are prohibited from referring to or copying the solutions of others, or giving completed solutions to anyone else taking the same course.

Naval courses may include a variety of questions -- multiple-choice, true-false, matching, etc. The questions are not grouped by type; regardless of type, they are presented in the same general sequence as the textbook material upon which they are based. This presentation is designed to preserve continuity of thought, permitting step-by-step development of ideas. Some courses use many types of questions, others only a few. The student can readily identify the type of each question (and the action required) through inspection of the samples given below.

MULTIPLE-CHOICE QUESTIONS

Each question contains several alternatives, one of which provides the best answer to the question. Select the best alternative, and blacken the appropriate box on the answer sheet.

SAMPLE

s-1. The first person to be appointed Secretary of Defense under the National Security Act of 1947 was

- 1. George Marshall
- 2. James Forrestal
- 3. Chester Nimitz
- 4. William Halsey

Indicate in this way on the answer sheet:

	1	2	3	4	
	T	F			
s-1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	---

TRUE-FALSE QUESTIONS

Mark each statement true or false as indicated below. If any part of the statement is false the statement is to be considered false. Make the decision, and blacken the appropriate box on the answer sheet.

SAMPLE

s-2. Any naval officer is authorized to correspond officially with any systems command of the Department of the Navy without his commanding officer's endorsement.

Indicate in this way on the answer sheet:

	1	2	3	4	
	T	F			
s-2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	---

MATCHING QUESTIONS

Each set of questions consists of two columns, each listing words, phrases or sentences. The task is to select the item in column B which is the best match for the item in column A that is being considered. Items in column B may be used once, more than once, or not at all. Specific instructions are given with each set of questions. Select the numbers identifying the answers and blacken the appropriate boxes on the answer sheet.

SAMPLE

In questions s-3 through s-6, match the name of the shipboard officer in column A by selecting from column B the name of the department in which the officer functions.

- | | | |
|-------------------------------|---------------------------|--|
| A | B | |
| s-3. Damage Control Assistant | 1. Operations Department | |
| s-4. CIC Officer | 2. Engineering Department | |
| s-5. Disbursing Officer | 3. Supply Department | |
| s-6. Communications Officer | | |

Indicate in this way on the answer sheet:

	1	2	3	4	
	T	F			
s-3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	---
s-4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	---
s-5	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	---
s-6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	---

Assignment 1

Advancement, Security and Maintenance

Textbook Assignment: DS 3&2, Vol 1, NAVEDTRA 10201-B1, pages 1 through 28

Learning Objective: Recognize and identify some of the general areas of responsibilities and system knowledge required of a DS3 and/or DS2. Included are security, systems, major job functions, troubleshooting, NTDS hardware and software, etc.

- 1-1. What should a DS be aware of and accept as a responsibility to increase his potential?
1. The system concept of his and other interfaced units
 2. A system's interfacing only
 3. His assigned duties only
 4. His assignment equipment only
- 1-2. As an aid in understanding the material in this course, with which of the following manuals should a DS be familiar with?
1. NAVEDTRA 10088 (Series) only
 2. NEETS only
 3. NAVEDTRA 10087 (Series) only
 4. All of the above
- 1-3. Which of the following is NOT generally regarded as having a security classification?
1. Operational scheduling
 2. Operational programming
 3. Computer equipment
 4. Retained data
- 1-4. In a classified publication, the letter "C" in parentheses, preceding a paragraph, indicates that the information is
1. secret
 2. top secret
 3. unclassified
 4. confidential
- 1-5. What is the largest single system task grouping that exists for the DS rating?
1. WWMCCS
 2. NTDS
 3. CMS-2
 4. ADPE
- 1-6. Which of the following is an example of troubleshooting?
1. Removing a module
 2. Replacing a transistor
 3. Determining a cause of malfunction
 4. Soldering a contact
- 1-7. Which of the following is NOT usually the central computer for an NTDS?
1. CP-642A
 2. UYK-5(V)
 3. UYK-7(V)
 4. CP-642B
- 1-8. What term is used to denote equipment which can extend a computer's basic capabilities?
1. Processors
 2. Extensions
 3. Interfacings
 4. Peripherals
- 1-9. When system devices transfer data back and forth and conversion of data is required, what type of equipment is used?
1. Interface
 2. Interpreter
 3. Integrator
 4. Interconnector

1-10. What are the two general categories of digital programs?

1. Checking and analyzing
2. Operational and maintenance
3. Manual and automatic
4. Interface and conversion

1-11. What type of system is used in analyzing accumulated data?

1. Fictional-time
2. Real-time
3. Nonreal-time
4. Actual-time

Learning Objective: Indicate the structure, responsibilities, requirements, and sources of additional information associated with advancement in the Data Systems Technician rating.

1-12. According to the present Regular Navy rating structure, which specialty of the following personnel is likely to be classified as a service rating?

1. OSCS (Senior Chief Operations Specialist) D. McConchie, USNR
2. ETR2 (Second Class Electronics Technician, Radar) G. Hoog, USNR
3. DS1 (First Class Data Systems Technician) M. Smith, USN
4. DS3 (Third Class Data Systems Technician, Electronic Data Systems Operator) J. Frisby, USN

1-13. All of the following actions are qualifications for advancement to DS3 except

1. completing required military and professional training courses
2. being recommended by your educational services officer
3. passing a servicewide competitive examination
4. demonstrating the ability to perform all the practical requirements

1-14. DS3 Moreland has passed the written examination for advancement to DS2, which of the following factors is among those which bear on Moreland's chances for actually advancing to DS2?

1. His length of time in service
2. His examination score
3. The quota for DS2
4. Each of the above

1-15. Under the new NAVPERS 18068 series which of the following refers to requirements that are directly related to work of a particular rating?

1. Quals
2. Occupational standards
3. NECs
4. Naval standards

Item 1-16 is to be judged True or False.

1-16. The Personnel Advancement Requirement (PAR) Program replaces the Record of Practical Factors.

1-17. The Personnel Advancement Requirement (PAR) Program provides a tool for the commanding officer to evaluate an individual's performance on a

1. yearly basis
2. monthly basis
3. weekly basis
4. daily basis

1-18. The Personnel Advancement Requirement (PAR) Program applies to which of the following paygrades?

1. E1-E6
2. E3-E6
3. E4-E7
4. E8-E9

1-19. When an individual completes the Military Requirements Navy Training Course, an entry is made in which of the following sections of NAVPERS 1414/4?

1. Section 1
2. Section 2
3. Section 3
4. Section 4

1-20. Robinsen is transferred from Bethesda to San Diego. To avoid having to requalify in practical factors at San Diego, Robinsen makes certain before leaving Bethesda that his service record contains an up-to-date copy of his

1. NAVPERS 6-2-13 form
2. NAVPERS 730 form
3. NAVTRA 1414/4 form
4. NAVPERS 1052-A form

1-21. What publication should you consult to obtain detailed information, for a lower rated man in your activity, on the training courses he should study for advancement?

1. - Bibliography for Advancement Study
2. NAVPERS 18068 series
3. Guide for Enlisted Classification
4. Shipboard training manuals

1-22. Which of the following symbols indicates that an entry in NAVEDTRA 10052 is a mandatory requirement for a candidate?

1. --
2. Δ
3. - *
4. @

1-23. Which publication contains a complete list of rating and subject matter manuals identified by NAVPERS, NAVTRA, or NAVEDTRA numbers?

1. Bibliography for Advancement Study
2. NAVPERS 18068 series
3. Manual of Enlisted Classifications
4. - List of Training Manuals and Correspondence Courses

For items 1-24 and 1-25, refer to the following study steps based on the suggestions for studying rate training manuals recommended in the textbook.

- A. Read chapter introductions, headings and subheadings.
- B. Consult the up-to-date edition of NAVPERS 18068 series for DS occupational standards.
- C. Schedule regular study sessions.
- D. Read each chapter in detail, list questions that occur to you about each unit, and make a written outline or take notes on unit material.
- E. Read all introductory material and familiarize yourself with the appendixes, and look over the book's contents indiscriminately.

1-24. Following study step E primarily helps you to

1. plan an intelligent supplementary reading program
2. - get a detailed idea of what the book covers
3. determine how intensely you will go into step D
4. determine how closely the information ties in with your own past experience

1-25. If you adhere to the study procedure recommended in your textbook, in what sequence do you follow the study steps?

1. B, A, E, C, D
2. - B, C, E, A, D
3. C, B, E, A, D
4. E, B, C, A, D

Learning Objective: Determine why specific equipment is emphasized, why the NTDS was chosen as the specific training vehicle for this text, and the effects an everchanging electronics technology has on all naval systems.

1-26. Which of the following reasons justify(ies) using NTDS as a training vehicle for teaching system concepts?

1. NTDS has a sufficient variety of equipment for complete exposure
2. There are more DSs in NTDS than in any other system
3. There is a major Navy commitment to NTDS
4. - All of the above

1-27. What best expresses the Navy's effort to adjust to constant changes in the data processing field?

1. Planned obsolescence
2. Rapid equipment upgrading and replacement
3. - Commitment to system concepts and hardware
4. All of the above

1-28. Question deleted.

1-35. Which of the following branches of the Navy first established an active program to upgrade miniature repair techniques?

1. Naval Material
2. -Avionics
3. Subsurface
4. Surface

1-36. Which of the following facilities is/are tasked with insuring that MERP-trained technicians stay qualified in their specialty?

1. -Mobile Technical Units
2. Naval Air Systems Command
3. Naval Ship Engineering Centers
4. MERP training commands

Items 1-29 through 1-32 should be judged True or False.

1-29. ICs sometimes have the same function although they appear to be different.

1-30. The only method used to identify ICs is the number of pins in actual use.

1-31. The main problem with ICs is usually found in the connecting pins.

1-32. The use of test equipment with ICs may result in symptoms not normally related to the normal operation.

1-33. When replacing ICs, which of the following leads should be connected first?

1. Vcb
2. Vss
3. Veb
4. - Vdd

Learning Objective: Identify the factors of miniature repair techniques that have brought increased emphasis to this area in terms of established naval facilities, schools, and repair programs.

1-34. When making repairs to miniature solid-state circuitry, which of the following is normally not involved?

1. A sense of perfection
2. More light
3. - Slower speed of work
4. Greater precision

1-37. In electroplating, when two different metals are used, the outer shell is (a) than the inner shell and the inner shell is (b)

- stronger, weaker
- | | |
|------------------|--------------|
| 1. (a) Thicker | (b) weaker |
| 2. (a) Thicker | (b) stronger |
| 3. (a) Thinner | (b) weaker |
| 4. - (a) Thinner | (b) stronger |

Learning Objective: Demonstrate or explain the means by which metals are joined together, their advantages and disadvantages, and comprehend the fundamental principles upon which specific metal joining techniques are based.

1-38. Which of the following metals is LEAST likely to be solderable with a 60/40 or a 63/37 solder?

1. Steel
2. - Aluminum
3. Bronze
4. Copper

1-39. The use of solid-core solder would require which of the following to be applied as a separate step when soldering?

1. Isoprophyl alcohol
2. - Flux
3. Solder
4. Heat

1-40. Question deleted.

1-41. A soldering tip gives evidence of being hot, but is very slow in heating the surface to which it is applied. Which of the following might account for this?

1. The surface is too large for the tip size
2. The wattage of the soldering iron is too low for the scale of the job
3. The metals in contact may be pitted or heavily oxidized
4. - Each of the above

1-42. Which, if any, of the following will probably decrease as the scale of the soldering job increases?

1. Wattage of iron
2. Size of tip
3. Length of time required
4. - None of the above

1-43. Metal which has a thin blue finish has been exposed to (a) heat for a (b), high, low lengthy, short period of time.

1. (a) Low (b) short
2. (a) Low (b) lengthy
3. (a) High (b) short
4. - (a) High (b) lengthy

1-44. Which of the following is/are most likely affected by problems with "wicking"?

1. Wire junctions
2. Wire insulators
3. Solid wire
4. - Stranded wire

1-45. What effect(s) can "wicking" have upon insulation?

1. It can cause it to melt, exposing the wire beneath
2. It can result in low resistance readings between the insulated wire and adjacent metal surfaces
3. It can hide the cause of intermittent continuity of wire readings which can result from broken wires that were "wicked"
4. - All of the above

1-46. What effect could "blowing" on a solder connection while it is cooling have?

1. - Create a fractured solder joint
2. Result in a strong "tempered" solder joint
3. Narrow the plastic range of the solder
4. Cause air bubbles to form in the solder

Learning Objective: Recognize differences between various metal joining technologies used in the electronics field, and identify key features of wire-wrap and termi-point techniques.

1-47. What components are used to temporarily join metal conductors?

1. Jumpers
2. - Male and female connectors
3. Lugs
4. Terminals

1-48. What purpose would color coding the wires in an equipment serve?

1. - It would identify each individual wire
2. It would identify the wire polarity
3. It would identify the wire voltage
4. It would identify the wire size

- 1-49. "Cold flow" is the result of excessive (a) pressure, temperature on a (b) insulated Teflon, Meline wire.
1. (a) pressure (b) Teflon
 2. (a) pressure (b) Meline
 3. (a) temperature (b) Teflon
 4. (a) temperature (b) Meline
- 1-50. A junction that is "gas tight" (no gaseous penetration is possible) would be resistive to which of the following corrosive forces?
1. Water saturation
 2. Humidity
 3. Condensation
 4. Each of the above
- 1-51. Which of the following is/are required for performing wire wraps?
1. Specially constructed wire
 2. Specific wire sizes
 3. Specific handtools
 4. All of the above
- 1-52. The use of (a) solid, braided wire in the wire-wrap technique is required in order to limit the (b) of the wire. size, uncoiling
1. (a) solid (b) size
 2. (a) solid (b) uncoiling
 3. (a) braided (b) size
 4. (a) braided (b) uncoiling
- 1-53. Suppose a wiring change in a piece of equipment meant adding another wrap to a pin that already has three wraps on it. An inspection of the pin shows that the pin is long enough to accommodate four wraps, but that spacing between the three wraps has placed the outer wrap at the top of the pin. Which of the following methods would correct this problem?
1. Remove the three wraps and remake four new wraps on the pin, tightly spacing one above the other
 2. Simply wrap the new wrap over the outer wrap
 3. Uncoil the outer wrap, twist the two wires together, and make a single wrap using the two wires
 4. Each of the above
- 1-54. There are four wraps on a single pin (#1 is the outer wrap, and #4 is the inner wrap). Which wrap(s) must be removed when removing #3?
1. #1 only
 2. #2 only
 3. Both #1 and #2
 4. #4
- 1-55. The identification of either a good or bad wire wrap is
1. usually done with an oscilloscope or multimeter
 2. only possible with a signal tracing technique
 3. easy to verify by attempting to dislodge the wrap (twisting, turning, pulling, etc.)
 4. possible with close visual inspection

1-56. Crimping may offer an advantage over soldering or wire-wrap procedures under which of the following conditions?

1. When using large diameter wire
2. When work must be hurried
3. When joining solid and flexible wires together
4. - All of the above

1-57. Which of the following would be required when using the termi-point technique?

1. Flexible wire
2. Clips
3. Insertion tool
4. - All of the above

Learning Objective: Recognize alternatives that are available when attempting to identify and obtain specific items through normal procurement channels such as the Navy Supply System.

1-58. A shop's tool inventory discloses that a number of essential soldering tools are missing. Which of the following often provides the LEAST reliable way of identifying precise replacements within the Navy Supply System?

1. - Using shipboard general supply catalogs
2. Browsing through Servmarts when possible
3. Researching supply requisition logs for the shop
4. Interviewing personnel from various technical ratings

1-59. With a number of essential soldering tools missing from a shop, and exact replacements desired, which of the following is MOST likely to produce the necessary information?

1. Relying exclusively on shipboard general supply catalogs
2. - Browsing through Servmarts when possible
3. Researching supply requisition logs for the shop
4. Interviewing personnel from other types of shops aboard ship

1-60. Which of the following may result in damage to microelectronic circuits?

1. The application of too much heat
2. Dropping the circuit board on a hard surface
3. Rapping the circuit board with a repair tool
4. - All of the above

Learning Objective: Identify some of the factors that control the adequacy of repair effort in support of equipment, and explain the additional safeguards that may be required if classified material is involved.

1-61. A technician's familiarity with and use of test equipment, tools, chemicals, and repair and maintenance techniques is determined by which of the following?

1. The training he has received
2. The requirements for his rate and NEC
3. - The needs of his equipment
4. All of the above

1-62. A previously repaired printed circuit board is found to be defective when attempts are made to use it either for troubleshooting or repair of the equipment. This would indicate which of the following conditions probably exists?

1. That the board was improperly repaired
2. That the board was either not tested or improperly tested following repairs
3. - Both 1 and 2 above
4. That the equipment is ruining newly installed boards as quickly as they are inserted

1-63. Which of the following circuit failings must be verified by actual or simulated in-circuit performance?

1. Lack of continuity
2. Poor mechanical linkage
3. - High frequency distortion
4. Insufficient solder heat

1-64. Which of the following would be the most probable cause for a repaired printed circuit board to not work properly?

1. Defective replacement part(s)
2. Poor repair techniques
3. A permanently damaged board
4. A defective soldering iron

Assignment 2

Maintenance

Textbook Assignment: DS 3&2, Vol 1, NAVEDTRA 10201-B1, pages 30 through 53

Learning Objective: Demonstrate the use of the color code, chassis markings, equipment layout, and schematic and logic print markings in identifying specific areas or components within the equipment.

- 2-1. Which of the following can be determined from the color code on a card?
1. Its general function
 2. Its purpose in the equipment
 3. Its position in the equipment
 4. All of the above
- 2-2. What color(s) used in resistive markings is/are NOT used when marking cards?
1. Neutral
 2. Gold
 3. Silver
 4. All of the above
- 2-3. To prevent different type cards from being interchanged, slots cut into a card will match
1. a color code on the female connector
 2. a color code on the male connector
 3. a key in the female connector
 4. a key in the male connector
- 2-4. What would be the primary purpose of a logic extension cable?
1. To add remote control of interequipment functions
 2. To allow greater component staging
 3. To provide power for testing capabilities
 4. To remove power for testing capabilities
- A digital device has 3 chassis, 7 rows per chassis, and 35 cards per row.
- Figure 2-1
- Refer to figure 2-1 when answering questions 2-5 and 2-6.
- 2-5. Which of the following would probably designate the center-most card in the digital device?
1. A1C1D18
 2. A3D18
 3. A1A2D18
 4. 03D18
- 2-6. Which of the following might be a test point designation for a card in the first chassis?
1. A1A1D13A
 2. A2B22B
 3. 01B22B
 4. A1H15C
- 2-7. A test point designation for a card designates test point "B," but only three test point eyelets are visible from the edge of the card - one midway to the top edge, one near the center, and one near the bottom edge. Which test point, if any, is "B"?
1. The bottom one
 2. The middle one
 3. The topmost one
 4. None; the "B" is probably a typographical error

- 2-8. What source is most likely to provide card, test point, and pin nomenclature for a particular piece of equipment?
1. The Installation Standards handbook of the EIMBs
 2. The Reference Data handbook of the EIMBs
 3. The Maintenance Requirement Cards (MRCs) of the 3-M system
 4. The manufacturer's technical manual for the equipment
- 2-9. Oscilloscopes that are able to reconstruct the trace outline from memory are referred to as which, if any, of the following?
1. Logic analyzers
 2. Synchrosopes
 3. Monitor scopes
 4. None of the above
- 2-10. The oscilloscope probe must connect with what portion of a circuit?
1. A conductor
 2. An insulator
 3. A source voltage
 4. A ground plane
- 2-11. Which of the following apply(ies) to test blocks?
1. They are used to test individual pins
 2. A chassis-test block-test is used to locate specific pins in an X-Y system coordinate
 3. They are always located in the immediate vicinity of the circuit under test
 4. All of the above
- 2-12. Which of the following describes a card extender?
1. It has male and female connectors
 2. It may have test points
 3. It usually contains no logic elements of its own
 4. Each of the above
- 2-13. Why are the results of a self-check test usually less reliable than results obtained by external test methods?
1. Self-check tests lack the flexibility that external test methods provide
 2. Self-check tests are less comprehensive than testing performed by external methods
 3. Self-check tests cannot give precise indications of probable difficulties
 4. Self-check circuitry is often interdependent with the circuits under test
- 2-14. What device will increase the ease of repair to printed circuit cards that contain ICs?
1. Card extender
 2. Pin crimper
 3. Clip-on tester
 4. Insertion socket
- 2-15. Which of the following is NOT always a responsibility of the DS in regard to his test equipment?
1. To maintain it
 2. To operate it properly
 3. To report any discrepancies
 4. To repair it
- 2-16. A red-blue-blue-green card can be replaced by which of the following?
1. 266500
 2. 702665A
 3. 5662
 4. 3776

Learning Objective: Make critical decisions that are required for effective troubleshooting of equipment problems by identifying significant factors and establishing orders of priorities.

2-17. Which of the following cards would NOT normally be exchanged with another card of the same type?

1. A saturation amplifier type
2. An exclusive OR type
3. An adjustable delay type
4. A flip-flop type

2-18. What is the primary consideration in evaluating the "proper" technique needed for equipment repairs?

1. Technique
2. Expense
3. Ease
4. Speed

2-19. In cases involving long periods between intermittent problems, which, if any, of the following will help identify the problem?

1. Develop short specialized programs to test specific problem areas
2. Reprogram the computer to bypass the troubled area
3. Randomly replace every card in the equipment
4. None of the above

2-20. What must a technician depend upon when dealing with intermittent problems?

1. His maintenance programs
2. His test equipment
3. His experience
4. All of the above

Learning Objective: Recognize the intent and scope of most technical manuals, their manner of organization, and the reliability of the information they contain.

2-21. When looking for the technical manual on a piece of equipment, how many volumes would be involved?

1. One
2. Two
3. More than two
4. Depends upon the equipment

2-22. If a portion of the technical manual consists primarily of foldouts, this section would most likely contain which of the following?

1. Schematics of electrical circuits
2. Logic prints of circuit operations
3. Chassis maps showing physical relationships
4. All of the above

2-23. Most major changes to technical manuals are accomplished by

1. glue-in labels
2. pen and ink changes
3. looseleaf insertions
4. all of the above

2-24. A ship's INSURV (Inspection and Survey) discloses some major discrepancies concerning the grounding straps that were part of the original installation on several pieces of equipment. Which sections of the equipment technical manuals would contain information on this subject?

1. Repair
2. Troubleshooting
3. Installation
4. General Information

2-25. In order to provide adequate maintenance support to his system and equipment, the technician will probably require a working familiarity with which of the following?

1. System software
2. Software documentation
3. Technical manuals
4. Each of the above

2-26. Which of the following is usually considered authoritative enough to answer any questions that arise in a technical manual as to how a specific area of the equipment works?

1. The detailed typewritten section on the principles of operation
2. The computer-aided manually drafted, and countersigned logic prints
3. The flow charts and timing graphs used to amplify explanations used in the text
4. No one section of a technical manual is usually regarded as being sufficiently accurate as to answer discrepancies that occur in any other part

2-27. From which of the following would a technician usually be able to obtain the stock number needed in ordering a replacement part for his equipment?

1. Chassis maps
2. Schematics or logic prints
3. Parts lists
4. Each of the above

2-28. By what method(s) can a technician make discrepancies in his documentation known to higher authority?

1. By using an EIB tearout comment sheet
2. By completing a 3M feedback form
3. By making necessary phone calls and office visits
4. Each of the above

2-29. Which of the following onboard sources of training assistance is available to the technician who wants to learn?

1. Supervisors
2. Technical documents
3. EMO
4. Each of the above

2-30. Which of the following sources of off-ship assistance are primarily concerned with follow-up training for ships?

1. MOTUs
2. Naval engineering centers
3. Naval school commands
4. All of the above

2-31. Which of the following engineering centers is/are primarily involved with shipboard systems?

1. NAVSEC
2. NAVAIRENGCEN
3. NAVELEXSYSENGCEN
4. Both 2 and 3 above

Assume that a request for technical assistance must be directed to one of three ships in the immediate vicinity. Ship 1 is known to carry a very similar system, but has different versions of the same equipment. Ship 2 has the identical equipment, but an entirely different configuration is employed. Ship 3 has different equipment versions and an entirely different system.

Figure 2-2

Refer to Figure 2-2 when answering items 2-32 through 2-34.

2-32. Because of equipment similarities, which ship(s) should be able to render the most effective assistance in troubleshooting a malfunctioning device?

1. Ship number 1
2. Ship number 2
3. Both 1 and 2 above
4. Ship number 3

Learning Objective: Make use of ship's power safely. Assist in explaining problems involved when using unauthorized equipment, and take an active role in providing a comprehensive electronic safety program for all hands aboard ship. To apply knowledge of both basic electrical principles and of a specific shipboard electrical environment when using test equipment or dealing with equipment casualties.

2-42. Which generator system(s) do(es) not provide a neutral return?

1. Shore system
2. Shipboard system
3. System used in aircraft
4. Both 2 and 3 above

2-43. The single-phase rms voltage supplied to wall receptacles in a shore system is 115 V.a.c. What would be the maximum rms voltage available at 2-phase receptacles within the same system?

1. 115 V.a.c. (either phase to ground)
2. 163 V.a.c. (115 V.a.c. times square root of 2)
3. 199 V.a.c. (115 V.a.c. times $2 \sin 120^\circ$)
4. 230 V.a.c. (the sum of the two voltages)

2-44. Which of the following would be characteristic of a shipboard generator system rather than a shore system?

1. Dual voltage is available
2. Ground current would require two phases being shorted to ground
3. Neutral return and ground are often in common
4. The generator provides a second voltage and a neutral return for single-phase equipment

2-45. Which of the following statements would be most accurate?

1. Some shipboard equipment may not be suited for use in shore systems
2. Some shore equipment may not be suited for use in shipboard systems
3. All shipboard equipment are unsuitable for use in shore systems
4. All shore equipment are unsuitable for use in shipboard systems

2-46. Military electrical and electronic equipment frequently are designed to use (a)

60 Hz, 400 Hz

input power since this can significantly reduce the

(b)

physical size, power requirements
of the equipment's power supply.

1. (a) 60 Hz (b) physical size
2. (a) 400 Hz (b) physical size
3. (a) 60 Hz (b) power requirements
4. (a) 400 Hz (b) power requirements

2-47. Which of the following components of a power supply would be affected by a change in the applied input frequency?

1. Filter capacitors
2. Filter coils
3. Transformer
4. All of the above

- 2-48. Which of the following is suitable for frequency conversion?
1. A static frequency converter
 2. A stabilized oscillator circuit
 3. A motor generator set
 4. Each of the above

2-49. Which description best fits a motor generator set?

1. An a.c. motor driving an a.c. generator
2. A d.c. motor driving an a.c. generator
3. An a.c. motor driving a d.c. generator
4. A d.c. motor driving a d.c. generator

2-50. Which, if any, of the following statements is TRUE?

1. Electricians normally perform operator maintenance on MG sets
2. Data Systems Technicians perform most scheduled PMS (preventive maintenance) tasks on assigned MG sets and controllers
3. Electronics Technicians perform all corrective maintenance on MG sets and controllers
4. None of the above

Learning Objective: Explain why electronic equipment must be cooled, the alternate methods used in cooling electronic equipment, and the advantages and disadvantages of the different methods. Diagram a basic water-cooled system and point out areas where DSS would have responsibilities if tasked with maintenance support of a water-cooled system.

2-51. Airborne contaminants can drastically cut

(a) thermal recovery, heat radiation
and (b) air flow, moisture resistance
in filtered equipment without proper maintenance.

1. (a) thermal recovery
(b) air flow
2. (a) thermal recovery
(b) moisture resistance
3. (a) heat radiation
(b) air flow
4. (a) heat radiation
(b) moisture resistance

2-52. Which of the following would be more common to water-cooled equipment than to air-cooled equipment?

1. A ventilator or fan
2. Large radiating surfaces
3. Equipment filters
4. Heat exchangers

2-53. Each water-cooled device must have two (a) flexible, rigid quick disconnect hoses, and two (b) hand, pressure relief valves.

1. (a) flexible
(b) hand
2. (a) flexible
(b) pressure relief
3. (a) rigid
(b) hand
4. (a) rigid
(b) pressure relief

2-54. When a chilled water system is contaminated chemically, the use of a (a) demineralizer, decontamination station is required, and when the chilled water system is contaminated physically, the use of a (b) decontamination station, micromesh filter, demineralizer is required.

1. (a) demineralizer
(b) decontamination station
2. (a) demineralizer
(b) micromesh filter
3. (a) decontamination station
(b) demineralizer
4. (a) decontamination station
(b) micromesh filter

2-55. The demineralizer and micromesh filter will be placed in (a) series, parallel with each other and in (b) series, parallel to the circulation path for the distilled water system.

1. (a) series (b) series
2. (a) series (b) parallel
3. (a) parallel (b) series
4. (a) parallel (b) parallel

2-56. To protect essential equipment from overheating when entering tropical ports, several remedial steps can be taken as the ship enters warm, stagnant waters. Which of the following steps would NOT normally be included?

1. Secure power to nonessential air-cooled equipment
2. Secure refrigeration
3. Reduce air-conditioning in living areas
4. Secure power to nonessential water-cooled equipment

2-57. Which of the following conditions can be detected by careful monitoring of the expansion tank water level?

1. Water contraction
2. Water expansion
3. Water leaks
4. All of the above

2-58. Because of the use of demineralized or distilled water for cooling, which of the following steps would NOT be necessary if a rupture occurred in the water-cooled system within a piece of electronic equipment?

1. Secure power going to the equipment
2. Secure hand valves on both sides of the rupture
3. Flush out the equipment's interior to eliminate any possible damage from salt water corrosion
4. Thoroughly mop up and dry the equipment's interior

Assignment 3

Test Equipment

Textbook Assignment: DS 3&2, Vol 1, NAVEDTRA 10201-B1, pages 48 through 59

Learning Objective: Recognize the basic principles of test equipment maintenance and test equipment safety precautions.

- 3-1. Electronic test equipment aids a DS technician in analyzing the performance of his assigned equipment by comparing the obtained measurements with standards established by the
1. commanding officer
 2. Chief of Naval Material
 3. equipment manufacturer
 4. type commander
- 3-2. Which of the following parts create magnetic fields which could contribute to errors in test equipment readings?
1. Transformers and generators
 2. Magnetrons
 3. Heavy current conductors
 4. All of the above

Items 3-3 through 3-5 are to be judged True or False.

- 3-3. The advantage of test equipment which uses batteries for primary power is that no voltages of lethal potential exist.
- 3-4. When in doubt, the DS technician should consult equipment instruction sheets when using measurement instruments that are calibrated for a particular job.
- 3-5. Normally, test probes not designed for a specific test equipment should not be used with that equipment.

Learning Objective: Determine the use of the shorting bar on electronic test equipments and identify personnel safety precautions when making test measurements.

- 3-6. Which of the following characteristics does NOT apply to the Fluke Differential Voltmeter?
1. The ground post is connected directly to Earth ground potential whenever the line cord is properly mated with a properly grounded a.c. power receptacle
 2. It is equipped with a two-wire line cord for shipboard use
 3. It is equipped with a three-wire line cord for shipboard use
 4. Personnel using this meter must check for conflicts in grounding before connecting the common side of the input to the ground binding post with the shorting bar

3-7. What precedence is used when checking equipment equipped with a two-prong power cord with a differential voltmeter?

- A. Equipment is energized
- B. Test lead is connected to the equipment chassis
- C. The two-prong plug is reversed
- D. Voltmeter reads line voltage

- 1. A, B, C, D
- 2. A, C, B, D
- 3. B, A, D, C
- 4. A, D, C, B

3-8. If no line voltage is measured after the equipment with a two-prong power cord has been energized, which of the following actions are carried out?

- 1. Check for defective test lead
- 2. Connect the common and ground leads between the meter and the chassis of the equipment to be tested
- 3. Make test measurements
- 4. 2 and 3 above

3-9. Under which of the following conditions should the shorting bar NOT be connected to the common terminal when making equipment measurements?

- 1. When measuring any power line voltage
- 2. When measuring a.c. potentials having both sides of the line "hot" with respect to ground
- 3. When measuring voltages in an equipment having a B minus common ground line
- 4. All of the above

3-10. Which of the following is NOT a good safety practice to follow when making test measurements on equipment?

- 1. Do not use test equipment known to be in poor condition
- 2. Use both hands only when servicing live equipment
- 3. Make sure you are not grounded when adjusting or measuring equipment
- 4. Use precaution when measuring voltages

Learning Objective: Recognize the basic application principles of test equipment. State the basic functions of a cathode-ray oscilloscope including the linear time base, nonlinear time base, synchronizing, and safety precautions used with this equipment.

3-11. Which of the following factors require that a DS technician be knowledgeable in the application of test equipment?

- 1. Faulty equipment repair
- 2. Preventive maintenance tasks
- 3. Placement of new equipment into operation
- 4. All of the above

3-12. Which of the following data would NOT be found in the Test Equipment Handbook of the EIMB?

- 1. Equipment installation standards
- 2. Personnel safety hazards
- 3. Data on specific test equipment models
- 4. Maintenance hints

3-13. The electrostatic cathode-ray tube (CRT) employs _____ (a) _____ current, _____ to deflect the electron beam, while the electromagnetic CRT employs _____ (b) _____ current, voltage, _____ for this purpose. _____ resistance

- 1. (a) current (b) resistance
- 2. (a) current (b) voltage
- 3. (a) voltage (b) current
- 4. (a) voltage (b) resistance

3-14. Which of the following functions is the electrostatic-deflection cathode-ray oscilloscope capable of displaying and/or performing?

- 1. Graphs of rapidly changing voltages
- 2. Data concerning frequency values, phase differences, and voltage amplitude
- 3. Localizing sources of distortion by tracing signals through electronic circuits and isolating troubles to particular stages
- 4. All of the above

3-15. Oscilloscopes are used to produce a graphical display of simple and complex voltage variations which contain frequency components ranging from

1. zero to 50 GHz
2. zero to 50 MHz
3. zero to 50 kHz
4. zero to 50 Hz

Items 3-16 and 3-17 are to be judged True or False.

3-16. The plug-in unit of an oscilloscope contains the power supplies, horizontal amplifier, sweep generator, main vertical amplifier, CRT, calibrator, and the controls associated with these circuits.

3-17. A multichannel plug-in unit of an oscilloscope provides two separate traces on the CRT which allows two functions to be displayed simultaneously.

3-18. The elapsed time or waveform duration on an oscilloscope is represented on the (a) _____ axis in either whole or parts of a second, and the amplitude, quantity, or intensity of the waveform is represented on the (b) _____ axis in either whole or parts of volts or amperes.

1. (a) Horizontal (b) horizontal
2. (a) Horizontal (b) vertical
3. (a) Vertical (b) vertical
4. (a) Horizontal (b) horizontal

Item 3-19 is to be judged True or False.

3-19. Any portion of the waveform on an oscilloscope extending below the horizontal reference line is considered positive, while any portion extending above the horizontal reference line is considered negative.

3-20. When analyzing and interpreting a waveform on the screen of a CRT, the signal is compared as a function of

1. another signal of known characteristics
2. another signal of unknown characteristics
3. horizontal deflection
4. vertical deflection

3-21. In most oscilloscope applications, the unknown signal is applied to the (a) _____ axis.

The (b) _____ axis is used for known function, and the characteristics are usually (c) _____ with respect

to time.

1. (a) Vertical
(b) Horizontal
(c) Nonlinear
2. (a) Horizontal
(b) Vertical
(c) Nonlinear
3. (a) Vertical
(b) Horizontal
(c) Linear
4. (a) Horizontal
(b) Vertical
(c) Linear

Items 3-22 and 3-23 are to be judged True or False.

3-22. One advantage of using a non-linear time base in the form of a sine wave is that it allows easy and accurate measurement of phase angles and frequency calibration of electronic equipment.

3-23. To lock the oscilloscope sweep generator to the frequency of the test signal for synchronization, a portion of the test signal is applied to the input of the sweep generator.

3-24. For which, if any, of the following reasons should the oscilloscope case NOT be removed when using or maintaining the oscilloscope?

1. The case should always be removed
2. It could possibly expose voltages that could cause a fatal shock
3. It reduces shielding of the oscilloscope which could allow stray pickup from external fields to be amplified and displayed on the scope
4. Both 2 and 3 above

Items 3-25 and 3-26 are to be judged True or False.

3-25. Extreme caution should be taken when handling a CRT, because undue stress or rough handling could cause the tube to implode.

3-26. If a CRT is broken, contact should be avoided with the internal fluorescent coating as it is extremely toxic.

3-27. When centering the electron beam (spot) of an oscilloscope, the intensity control should be turned

1. to a brightness which will prevent burning the screen coating
2. counterclockwise
3. clockwise
4. off

Items 3-28 and 3-29 are to be judged True or False.

3-28. The length of the ground lead can affect oscilloscope displays when checking radiofrequency signals, because the inductive reactance factor of the ground lead may place the oscilloscope circuits above RF ground.

3-29. When dealing with circuits designed to operate above ground, it is imperative that the oscilloscope remain in its case.

Learning Objective: Recognize the basic construction, capabilities, operating principles, and the primary operating controls of the AN/USM-281A Oscilloscope.

3-30. In addition to displaying waveforms, the AN/USM-281A Oscilloscope is capable of accurately measuring which of the following?

1. Rise time and magnitude of a waveform
2. Time difference between any two points on a displayed waveform
3. Time comparison of two separate waveforms
4. All of the above

Refer to figure 3-2 in the textbook while answering items 3-31 through 3-34.

3-31. Which of the following characteristics is NOT contained or provided by the oscilloscope assembly of the AN/USM-281A Oscilloscope?

1. Circuitry for projecting a beam onto the CRT screen and the controls to adjust intensity, focus, and horizontal position of the beam on the CRT
2. A dual channel vertical amplifier containing circuitry for producing vertical deflection
3. A horizontal amplifier to amplify the selected time base signal and provide a linear deflection voltage to the horizontal plates of the CRT
4. The power switch, scale illumination control, and two calibrated output jacks

3-32. Which of the following controls is/are provided by the base and time delay generator of the AN/USM-281A Oscilloscope?

1. Front panel controls to provide a selection of four modes of operation; main sweep only, mixed sweep, delayed sweep, and single sweep
2. Controls for selecting automatic or triggered time base, trigger source, polarity, level, and frequency range
3. A calibrated ten-turn control for precise measurement of the delay time to the start of the delayed sweep
4. All of the above

3-33. Which of the following observations is the dual channel vertical amplifier of the AN/USM-281A Oscilloscope capable of displaying?

1. Simultaneous viewing of two separate waveforms
2. Viewing one waveform on either of two channels
3. Both 1 and 2 above
4. Simultaneous viewing of the same waveform on both channels

Item 3-34 is to be answered True or False.

3-34. The dual channel vertical amplifier of the AN/USM-281A Oscilloscope provides for combining two waveforms on one trace to produce the algebraic sum or difference of the two waveforms.

Refer to figure 3-3 in the textbook while answering items 3-35 through 3-49.

For items 3-35 through 3-37, match the function performed by the oscilloscope assembly of the AN/USM-281A Oscilloscope in column B with the primary operating control or switch which selects that function listed in column A. All responses in column B are not necessarily used.

A. CONTROL/ SWITCH	B. FUNCTION
3-35. HORIZONTAL POSITION	1. Selects the internal time base
3-36. MAGNIFIER	2. Determines which time base signal is applied to the horizontal amplifier
3-37. DISPLAY	3. Consists of two knobs, one for fine adjustment and the other for coarse adjustment
	4. Determines the gain of the horizontal amplifier and is used to expand the trace

For items 3-38 through 3-40, match the function performed by the oscilloscope assembly of the AN/USM-281A Oscilloscope in column B with the primary operating control or switch which selects that function listed in column A. All responses in column B are not necessarily used.

	<u>A. CONTROL/ SWITCH</u>	<u>B. FUNCTION</u>
3-38.	EXT CAL	1. Determines the type of coupling for an external signal
3-39.	EXT SENS	
3-40.	A.c.-d.c. switch	2. Determines the intensity of the electron beam
		3. Connects the horizontal amplifier input to the EXT INPUT connector through a variable resistor
		4. Connects the HORIZONTAL amplifier input to the EXT INPUT connector

For items 3-41 through 3-43, match the function performed by the time base and delay generator of the AN/USM-281A Oscilloscope in column B with the control or switch which selects that function listed in column A. All responses in column B are not necessarily used.

	<u>A. CONTROL/ SWITCH</u>	<u>B. FUNCTION</u>
3-41.	SWEEP MODE	1. Provides a sweep only when a trigger signal is present
3-42.	NORM	
3-43.	AUTO	2. Determines the type of main sweep operation
		3. Provides only one sweep when triggered
		4. Provides a free running sweep when no trigger is present or a triggered sweep if a trigger signal greater than 50 Hz is present

For items 3-44 through 3-46, match the function performed by the time base and delay generator of the AN/USM-281A Oscilloscope in column B with the control or switch which selects that function listed in column A. All responses in column B are not necessarily used.

	<u>A. CONTROL/ SWITCH</u>	<u>B. FUNCTION</u>
3-44.	TIME/DIV	1. Determines the voltage level of the input waveform at which the main or delayed sweep will be triggered
3-45.	TRIGGER LEVEL	2. Used with the main TIME/DIV switch to determine the delay time before the start of the delayed time base
3-46.	DELAY (DIV)	3. Provides fine adjustments for the main and delayed sweep speeds
		4. Selects the main sweep speed

For items 3-47 through 3-49, match the function performed by the dual channel vertical amplifier of the AN/USM-281A Oscilloscope in column B with the control or switch which selects that function listed in column A. All responses in column B are not necessarily used.

	<u>A. CONTROL/ SWITCH</u>	<u>B. FUNCTION</u>
3-47.	DISPLAY	1. Used to expand the vertical trace
3-48.	VOLTS/DIV	2. Switches the polarity of the vertical display
3-49.	VERTICAL MAGNIFIER	3. Selects the type of vertical display to be used
		4. Controls the calibrated input attenuation for both channel A and B amplifiers

Learning Objective: Using a functional block diagram along with the textbook, identify the functions of the various circuits of the AN/USM-281A Oscilloscope.

Refer to figure 3-4 in the textbook while answering items 3-50 through 3-66.

- 3-50. Which of the following circuitry, contained in the oscilloscope assembly, has no relationship in producing intensity for the CRT?
1. Low voltage supply
 2. Horizontal amplifier
 3. High voltage supply
 4. Gate amplifier
- 3-51. Which of the following circuitry is NOT used in producing internal horizontal deflection?
1. Horizontal amplifier
 2. Internal trigger amplifier
 3. Horizontal preamplifier
 4. Main and delayed trigger generator
- 3-52. The horizontal amplifier section accepts an external or internal time base signal and (a) amplifies, the signal to the attenuates (b) level required current, voltage to produce the (c) horizontal displacement of the CRT vertical beam.
1. (a) amplifies
(b) current
(c) vertical
 2. (a) attenuates
(b) voltage
(c) vertical
 3. (a) attenuates
(b) current
(c) horizontal
 4. (a) amplifies
(b) voltage
(c) horizontal
- 3-53. Which of the following functions does the output of the gate amplifier cause when applied to the control grid of the CRT?
1. The CRT beam to be cut off during retrace
 2. The CRT beam to be cut off during switching when operating in dual channel chopped mode
 3. Intensity modulation of the CRT beam is produced when a Z-AXIS input is applied
 4. All of the above
- 3-54. The calibrator outputs are useful in adjusting and troubleshooting the oscilloscope. Which of the following types of waveform does it provide to the front-panel connector?
1. Sine wave
 2. Sawtooth
 3. Square wave
 4. Any of the above
- Item 3-55 is to be judged True or False.
- 3-55. The main and delayed sweep and the main and delayed gate output amplifiers are double-stage, cathode-follower amplifiers that accept main sweep, main gate, delayed sweep, and delayed gate signals and provide a low impedance output to four rear-panel connectors.
- 3-56. What circuit in the dual channel vertical amplifier boosts the signal to the level necessary to drive the vertical deflection plates in the CRT?
1. Output amplifier
 2. Gate control
 3. Sync amplifier
 4. Channel A and/or B input amplifier

- 3-57. Which of the following circuits provides the control signal to the gate control circuit to determine which vertical channel is displayed?
1. Blanking amplifier
 2. Gate amplifier
 3. Multivibrator
 4. Calibrator
- 3-58. In the two alternate modes of operation, the multivibrator is (a) and stable, unstable, bistable switches only when triggered by the time base triggering signal, causing the multivibrator to switch channels at (b) random, the completion of each sweep.
1. (a) stable
(b) the completion of each sweep
 2. (a) bistable
(b) random
 3. (a) unstable
(b) random
 4. (a) bistable
(b) the completion of each sweep
- 3-59. In the ALT B TRIGGER and CHOP B TRIGGER modes of operation, the (a) channel B, composite vertical signal is amplified by the sync amplifier and supplied to the (b) output amplifier, time base and delay generator.
1. (a) composite vertical
(b) output amplifier
 2. (a) channel B
(b) time base and delay generator
 3. (a) channel B
(b) output amplifier
 4. (a) composite vertical
(b) time base and delay generator
- 3-60. Which of the following statements is INCONSISTENT with the function of the main trigger generator and amplifier?
1. The main trigger generator may receive a trigger signal from an internal, external, or line source
 2. The main sweep generator receives a sharp negative trigger pulse
 3. While in the NORM or SINGLE mode, the main trigger generator produces a trigger output even though it receives no input trigger
 4. The trigger generator produces a trigger output in the absence of an incoming signal when it is in the AUTO mode
- 3-61. When the main sweep generator receives a trigger from the main trigger generator and amplifier, it produces a (a) negative, positive rectangular gate pulse and a (b) going sawtooth negative, positive voltage.
1. (a) negative (b) positive
 2. (a) negative (b) negative
 3. (a) positive (b) negative
 4. (a) positive (b) positive
- 3-62. The purpose of the sawtooth voltage produced by the main sweep generator is to
1. drive the vertical deflection plates
 2. drive the horizontal deflection plates
 3. attenuate the rectangular gate pulse
 4. amplify the rectangular gate pulse

Item 3-63 is to be judged True or False.

3-63. The delayed trigger generator and amplifier section is designed to receive a signal from an internal, external, or AUTO source.

3-64. Which of the following functions is performed by the delayed trigger generator and amplifier when an internal or external signal source is selected?

1. It amplifies the incoming trigger signal
2. It compares the incoming trigger signal to the preset trigger level set by the delayed TRIGGER LEVEL control
3. It produces a sharp negative output pulse to the delayed sweep generator
4. All of the above

Items 3-65 through 3-67 are to be judged True or False.

3-65. The delayed sweep output is applied through the sweep display switch to the horizontal amplifier in the MIXED, DELAYED, or AUTO sweep modes.

3-66. When an AUTO source is selected, the delayed sweep cycle is terminated when the sweep voltage reaches a predetermined level and switches the delayed trigger and amplifier section to the disabled gate condition.

3-67. The variable capacitance across the internal resistance of the probe used with the AN/USM-281A Oscilloscope must be adjusted in order to accurately measure high frequency signals or fast rising waveforms.

Assignment 4

Test Equipment

Textbook Assignment: DS 3&2, Vol 1, NAVEDTRA 10201-B1, pages 60 through 78

Learning Objective: Identify the various uses and functions of the Multimeter AN/PSM-4.

- 4-1. What warning device is included with the high voltage probe of Multimeter AN/PSM-4 to indicate the presence of high voltages?
1. Buzzer
 2. Circuit breaker
 3. Fuse
 4. Light
- 4-2. Which of the following measurements can be made directly with Multimeter AN/PSM-4?
1. Capacitance; 1 mfd
 2. A.c. current; 150 milliamps
 3. D.c. current; 5 amps
 4. Frequency; 15 kHz
- 4-3. What is the maximum d.c. voltage that can be measured with Multimeter AN/PSM-4 and the high voltage probe?
1. 500 V
 2. 1,000 V
 3. 5,000 V
 4. 10,000 V
- 4-4. Which of the following components is NOT in the d.c. voltmeter circuit when the red test lead is connected into the 1000 VDC jack?
1. Common jack
 2. Function switch S-101
 3. Range switch S-102
 4. Meter movement
- 4-5. Assume that the meter is set for measuring d.c. voltages in the 250-volt range. If range switch S-102 is then switched from the 250-volt position to the 500-volt position, what circuit change enables the meter movement to indicate d.c. voltages in the 500-volt range?
1. The connections to the meter movement are reversed
 2. The resistance connected in series with the meter movement
 3. The resistance connected in parallel with the meter movement
 4. A different meter movement is selected
- 4-6. What value of a.c. voltage is indicated by the meter?
1. Average
 2. Maximum
 3. Peak-to-peak
 4. Root-mean-square (rms)
- 4-7. Range switch S-102 is NOT in the d.c. current circuit when the meter is set to measure
1. 1 - 100 μ A
 2. 1 - 10 mA
 3. 100 - 1000 mA
 4. 1 - 10 A

4-8. Multimeter AN/PSM-4 contains circuit adjustments which permit the meter to indicate a.c. and d.c. volts, d.c. currents, and resistances. Actually, the basic meter movement directly measures only

1. A.c. voltage
2. D.c. voltage
3. D.c. current
4. Resistance

4-9. What is the normal setting of function switch S-101 for measuring d.c. volts?

1. ACV
2. DIRECT
3. OUTPUT
4. REVERSAL

To answer items 4-10 through 4-13, select the proper test lead connections and switch positions in table 4-1 for making the measurement indicated in each item.

Table 4-1. Test lead connections and switch positions for Multimeter AN/PSM-4.

A.	Black test lead in COMMON
B.	Red test lead in +V MA OHMS
C.	Red test lead in +10 AMPS
D.	Red test lead in 1000 VDC
E.	High voltage probe in +5000 VDC
F.	S-101 at REVERSAL
G.	S-101 at DIRECT
H.	S-101 at ACV
I.	S-101 at OUTPUT
J.	S-101 at DC μ A MA AMPS
K.	S-101 at R x 1
L.	S-101 at R x 10
M.	S-101 at R x 100
N.	S-101 at R x 1000
O.	S-101 at R x 10000
P.	S-102 at 2.5 V 100 μ A
Q.	S-102 at 5 V 1 MA
R.	S-102 at 10 V 5 MA
S.	S-102 at 25 V 10 MA
T.	S-102 at 50 V 50 MA
U.	S-102 at 100 V 100 MA
V.	S-102 at 250 V 500 MA
W.	S-102 at 500 V 1000 MA/AMPS

4-10. 65 - 75 mA, d.c.

1. A, B, G, T
2. A, B, G, M
3. A, B, J, U
4. A, C, J, V

4-11. 5 - 10 ohms

1. A, B, K
2. A, B, O
3. A, B, I, Q
4. B, D, N, P

4-12. 500 - 750 volts, d.c.

1. A, B, F, W
2. A, D, G
3. A, D, H
4. A, E, H

4-13. 10 - 12 volts, a.c. (a.c. voltage portion of mixed a.c. and d.c. voltages)

1. A, B, G, R
2. A, B, L, S
3. A, B, H, S
4. A, B, I, S

4-14. The zero ohms adjustment on Multimeter AN/PSM-4 is made by

1. shorting the test leads together and turning the ZERO OHMS control until the meter reads zero ohms
2. turning the ZERO OHMS control until the meter reads zero ohms before touching the test leads to anything
3. placing a standard resistor between the test leads and turning the ZERO OHMS control until the meter reads zero ohms
4. placing the resistor to be measured between the test leads and turning the ZERO OHMS control until the meter reads zero ohms

Learning Objective: Recognize the capabilities, uses, advantages, and functions of the Electronic Multimeter AN/USM-116C.

- 4-15. Electronic voltmeters such as the AN/USM-116C have a characteristic high input impedance. A significant advantage of this feature is that it enables an operator to
1. make current measurements without inserting the meter into the circuit
 2. make a.c. voltage measurements that are practically independent of the frequency of the voltage
 3. make voltage measurements without adding an appreciable load to the circuit
 4. measure d.c. voltages in the range of .01 to 1.0 volts and currents in the range of 20 to 200 microamperes

For items 4-16 through 4-19, associate the function performed by the AN/USM-116C Electronic Multimeter given in column B with the switch that selects that function listed in column A. Responses in column B are used only once.

	<u>A. SWITCH</u>	<u>B. FUNCTION</u>
4-16.	FUNCTION SELECTOR	1. The black knob serves to balance the multimeter for proper accuracy when measuring d.c. volts, a.c. volts, and ohms and the red knob permits secondary adjustment of the low a.c. voltage ranges
4-17.	RANGE SELECTOR	2. Determines the type of measurement to be made
4-18.	Blue OHMS scale	3. Determines the desired range of a particular measurement
4-19.	ZERO ADJ	4. Used for all resistance measurements

- 4-20. What measurement requires a probe with a diode inside it?
1. A.c. volts
 2. D.c. volts
 3. D.c. current
 4. Resistance

Item 4-21 is to be judged True or False.

- 4-21. The meter movement is connected across a balanced bridge circuit so that it measures the amount of unbalance in the bridge caused by the voltage that is being measured.
- 4-22. What section does NOT make use of the bridge circuit?
1. A.c. voltmeter
 2. D.c. voltmeter
 3. Milliammeter
 4. Ohmmeter

Learning Objective: Specify the various uses, capabilities, advantages, and functions of the Model 803D Differential Voltmeter.

- 4-23. For which of the following functions is the Model 803D Differential Voltmeter used?
1. Highly accurate measurements of a.c. voltages from 0.001 to 500 volts
 2. Highly accurate measurements of d.c. voltages from zero to 500 volts (or up to 30,000 volts using the precision voltage dividers)
 3. Comparison of an unknown voltage with an internal reference voltage and indication of the difference in their values
 4. All of the above
- 4-24. The Model 803D Differential Voltmeter can be used as a
1. vacuum tube voltmeter (vtvm)
 2. precision potentiometer
 3. megohmmeter for measurement of high resistance
 4. meter for all the above

Item 4-25 is to be judged True or False.

4-25. An advantage of the Model 803D Differential Voltmeter is that it will not load the circuit under test once a balance (null) condition has been reached.

For items 4-26 through 4-29, associate the function performed in column B with the Model 803D Differential Voltmeter control or switch listed in column A. Responses in column B are used only once.

A. CONTROL/ SWITCH	B. FUNCTION
4-26. CALIBRATE control	1. Set to the vtvm position for determining the approximate value of unknown voltage prior to differential measurements
4-27. RANGE switch	
4-28. NULL switch	
4-29. A, B, C, D, and E voltage readout dials	2. Used with the OPERATE/CALIBRATE switch to vary the output of the 500 volt d.c. reference supply 3. Provides an in-line readout of the amount of internal reference voltage necessary to null the unknown voltage 4. Selects the desired voltage range or an A.C. NULL MULTIPLIER

4-30. When using the Model 803D for d.c. differential voltmeter operation, a (a) minute warmup period two, ten should be allowed so the meter components will stabilize and the internal 500 volt reference supply should be adjusted for (b) zero, maximum deflection.

1. (a) ten (b) maximum
2. (a) two (b) zero
3. (a) ten (b) zero
4. (a) two (b) maximum

Information for items 4-31 and 4-32. The Model 803D is set for d.c. differential voltmeter operation and the internal 500 volt reference supply has been adjusted for meter deflection. The NULL switch is in the vtvm position and the RANGE switch has been set to allow an on-scale reading.

4-31. The approximate value of the unknown voltage is indicated on the upper meter scale as 450 volts. Which decimal light will be illuminated?

1. Above dial A
2. Between dial A and B
3. Between dial B and C
4. Between dial C and D

Items 4-32 and 4-33 are to be judged True or False.

4-32. Refer to table 3-1 in the textbook. When the NULL switch is successively set to more sensitive null ranges, the voltage readout dials are adjusted for zero meter deflection in each null position and the measured voltage is read directly from the five voltage readout dials.

4-33. For a.c. measurements, the Model 803D operates essentially the same as for approximate and accurate d.c. measurements, after the a.c. input voltage has been converted to a d.c. voltage by the a.c. to d.c. converter.

Refer to figure 3-16 in the textbook while answering items 4-34 through 4-38.

For items 4-34 through 4-36, associate the functions which take place in the d.c. vacuum tube voltmeter given in column B with the device or network in the vtvm listed in column A which performs these specific tasks. All responses in column B are not necessarily used.

	<u>A. DEVICE/ NETWORK</u>	<u>B. FUNCTION</u>
4-34.	Null detector	1. Uses the taut-band suspension principle
4-35.	D.c. attenuator	2. Modulates, amplifies, rectifies, and filters the d.c. signal input to produce a d.c. output
4-36.	Meter	3. Loads the circuit being tested, once a balance (null) condition has been reached
		4. Reduces the voltage span of each range to a common usable range

4-37. Which of the following functions of the Model 803D zero to 500 volt d.c. reference supply is INCONSISTENT with its operation?

1. The output of the 500 volt power supply is applied directly to the attenuator for the 500 volt d.c. range, while in the 50, 5, and 0.5 volt d.c. range, the range divider reduces the voltage to 50, 5, and 0.5 volts before it is applied to the attenuator
2. For any a.c. range, the range divider always reduces the voltage to 50 volts
3. The attenuator divides its input voltage (500, 50, 5, or 0.5 volts) into 50,000 equal increments, any number of which may be selected by setting the five decades with the voltage readout dials
4. The primary reference is a battery used to calibrate the 500 volt supply

4-38. Which of the following characteristics of the a.c. to d.c. converter circuits of the Model 803D is INCONSISTENT with its operation?

1. The attenuator is used to reduce the a.c. input voltage by a factor of 10 or 100, as required to restrict the operational amplifier input to 5 volts maximum for full scale inputs of 50 and 500 volts respectively
2. The operational amplifier contains three resistance-capacitance coupled amplifier stages with high positive feedback, which is used to make the rectification characteristics of the diode linear and stable
3. The pulsating d.c. produced by the rectifier is filtered to obtain a d.c. voltage that is proportional to the average value of the a.c. input voltage
4. A diode in the rectifier-filter circuit is used to convert the unknown a.c. into pulsating d.c.

Learning Objective: Describe the use and operation of the AN/USM-207 Electronic Counter.

4-39. Which of the following frequencies is a standard output signal of the AN/USM-207 electronic counter?

1. 15 kHz
2. 200 Hz
3. 100 Hz
4. 5 Hz

4-40. With an input frequency of 800 kHz to the AN/USM-207, which of the following frequencies is available as an output frequency?

1. 10 Hz
2. 2 Hz
3. 8 Hz
4. 4 Hz

4-41. What is the standard output frequency of the Radio Frequency Oscillator 0-1267/URM-207?

1. 1 MHz
2. 10 MHz
3. 10 kHz
4. 100 kHz

4-42. Which of the following operations requires the use of the Radio Frequency Oscillator 0-1267/URM-207 when an external standard signal is not applied?

1. Totalizing
2. Time interval
3. Period of cyclic signal
4. Frequency ratio

4-43. Which of the following frequencies may be used as an external standard input to the AN/URM-207?

1. 1 MHz or 10 MHz
2. 100 kHz or 1 MHz
3. 10 kHz or 100 kHz
4. 1 kHz or 10 kHz

4-44. In what frequency range does the Electronic Frequency Converter CV-1921/USM-207 permit the measurement of signals with a greater sensitivity than is possible with the basic counter?

1. 100 MHz to 500 MHz
2. 35 MHz to 100 MHz
3. 0 Hz to 500 MHz
4. 0 Hz to 35 MHz

For items 4-45 through 4-48, associate the functions performed by the front panel controls of the AN/USM-207 given in column B with the switch or device that selects that function listed in column A. Responses in column B are used only once.

	<u>A. SWITCH/ DEVICE</u>	<u>B. FUNCTION</u>
4-45.	FREQ. A input connector	1. Indicates in green when the signal applied to the converter INPUT connector is sufficient to provide a valid digital readout and indicates in red when the input signal is insufficient or questionable, incorrectly attenuated, or the mixed frequency is incorrect
4-46.	SENSITIVITY switch	2. Selects a mixing frequency for heterodyne frequency measurement
4-47.	LEVEL meter	3. Selects source of input signal in frequency, frequency ratio, and totalizing modes of operation
4-48.	FREQUENCY TUNING-MC switch	4. Accepts an external signal for frequency and frequency ratio measurements, totalizing, and obtaining scaled outputs

For items 4-49 through 4-51, associate the functions performed by the front panel controls of the AN/USM-207 given in column B with the switch that selects that function listed in column A. All responses in column B are not necessarily used.

	<u>A. SWITCH</u>	<u>B. FUNCTION</u>
4-49.	STD FREQ OUT switch (red)	1. Selects measurement or scaling mode of operation in conjunction with positions of SENSITIVITY switch and time base switch
4-50.	STBY position of POWER switch	2. Selects the frequency ratio measurement in the 10^8 position when used with the FUNCTION switch
4-51.	STD FREQ OUT switch (black)	3. Selects the frequency that appears at the SCALE OUT connector on the rear panel
		4. Energizes the radiofrequency oscillator

4-52. What is the input frequency range of the AN/USM-207 when the Electronic Frequency Converter CV-1921/USM-207 is installed?

1. 100 MHz to 500 MHz
2. 35 MHz to 100 MHz
3. 1 Hz to 500 MHz
4. 1 Hz to 100 MHz

4-53. What is the output frequency range of the Electronic Frequency Converter CV-1921/USM-207?

1. 35 MHz to 100 MHz
2. 5 MHz to 100 MHz
3. 1 MHz to 10 MHz
4. 0 Hz to 100 MHz

4-54. What is the input frequency range of the Electronic Frequency Converter CV-1921/USM-207 when used for frequency conversion?

1. 100 MHz to 500 MHz
2. 35 MHz to 100 MHz
3. 0 Hz to 500 MHz
4. 0 Hz to 35 MHz

4-55. Precision timing signals in the AN/USM-207 are provided by the

1. scaler
2. gate control
3. "A" amplifier
4. 1 MHz and 10 MHz multiplier

4-56. Which of the following functional sections of the AN/USM-207 divides the standard frequencies for use in other sections?

1. Scaler
2. Gate control
3. Electronic Frequency Converter CV-1921/USM-207
4. 1 MHz to 10 MHz multiplier

4-57. Which of the following functional sections of the AN/USM-207 controls the counting time of the count decades?

1. Scaler
2. Gate control
3. "C" amplifier
4. "A" amplifier

Learning Objective: Specify the purpose and methods of testing semiconductor devices.

Item 4-58 is to be judged True or False.

4-58. Transistors are capable of operating in excess of 30,000 hours at maximum rating without failure and are often soldered in the circuit in much the same manner as resistors and capacitors.

4-59. While testing a semiconductor, it is determined that the forward resistance value is 40 ohms. The diode may be considered good if the back resistance is

1. more than 400 ohms
2. more than 4 ohms
3. less than 400 ohms
4. less than 4 ohms

4-60. When testing a semiconductor diode with an ohmmeter, a different resistance measurement is indicated when the ohmmeter test leads are reversed. The larger value is called (a) negative, back resistance and the smaller value is called (b) positive, forward resistance.

1. (a) back (b) positive
2. (a) negative (b) positive
3. (a) back (b) forward
4. (a) negative (b) forward

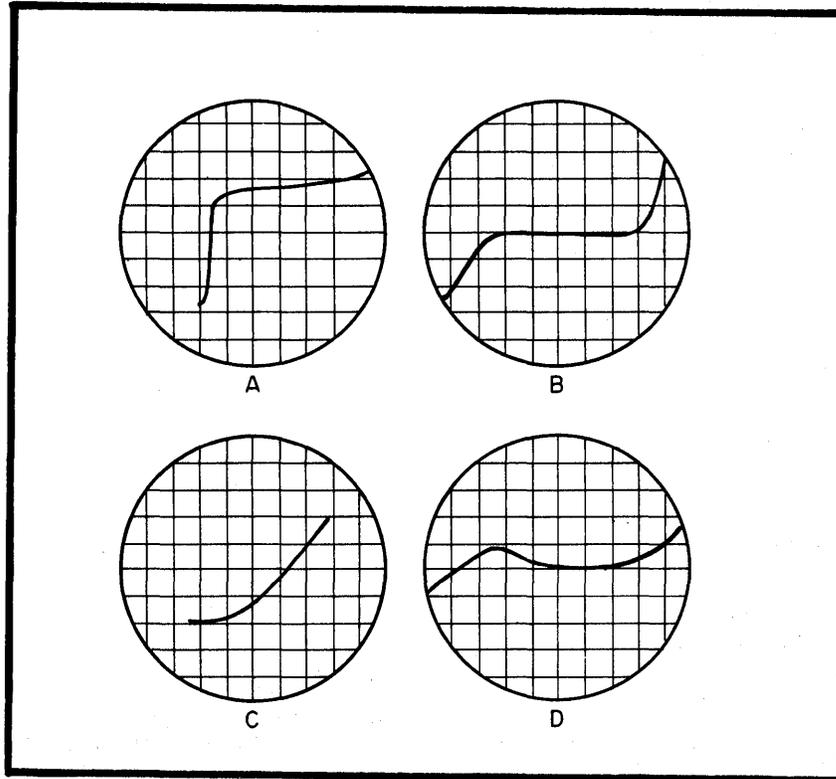


Figure 4-1. Characteristic oscilloscope curves

- 4-61. Which of the characteristic oscilloscope curves in figure 4-1 represents a normal diode?
1. A
 2. B
 3. C
 4. D
- 4-62. Which of the characteristic curves in figure 4-1 represents a normal zener diode?
1. A
 2. B
 3. C
 4. D
- 4-63. Under which of the following conditions may a transistor be removed from or inserted into an electronic circuit?
1. After all power has been removed from the circuit
 2. After jumpers have been placed between the transistor leads and ground
 3. Any time necessary
 4. Only when there is no input signal applied to the circuit
- 4-64. Transistor circuits, other than pulse and power amplifier stages, are usually biased so that the emitter current is from (a) $\frac{0.5 \text{ to } 3}{3 \text{ to } 15}$ milliamperes and the collector voltage is from (b) $\frac{3 \text{ to } 15}{30 \text{ to } 150}$ volts.
1. (a) 0.5 to 3 (b) 30 to 150
 2. (a) 3 to 15 (b) 30 to 150
 3. (a) 0.5 to 3 (b) 3 to 15
 4. (a) 3 to 15 (b) 3 to 15
- 4-65. Which of the following forward to back resistance ratios, (a) C to B, (b) B to E, and (c) E to C, would indicate a normal transistor?
1. (a) 500:1 (b) 500:1 (c) 1:1
 2. (a) 500:1 (b) 500:1 (c) 500:1
 3. (a) 450:1 (b) 1:1 (c) 500:1
 4. (a) 500:1 (b) 500:1 (c) 480:1

Learning Objective: Describe the use and operation of Semiconductor Test Set AN/USM-206A.

- 4-66. Which of the following transistor parameters are tested with the AN/USM-206A?
1. Collector leakage, cutoff frequency
 2. Collector leakage, maximum power dissipation
 3. Collector leakage, transistor current gain
 4. Emitter to base reverse voltage, transistor current gain
- 4-67. In addition to the test made by the AN/USM-206A in the previous item, which of the following measurements is the set capable of testing?
1. Resistance appearing at the electrodes
 2. Shorted or open diodes
 3. Forward transconductance of field effect transistors
 4. All of the above
- 4-68. When testing a transistor in the AN/USM-206A, which of the following is set to the type of transistor being tested?
1. BETA CAL control
 2. FUNCTION switch
 3. METER
 4. PNP/NPN switch
- 4-69. While testing a transistor, when is the BETA X1 position of S1 used?
1. When the beta is 10 or less
 2. When the beta is 10 or greater
 3. When the meter reads in the red box on the top scale
 4. When the meter reads full scale on the top scale
- 4-70. When will the best accuracy on the BETA X10 scale be obtained while testing a transistor on the AN/USM-206A?
1. When the OHMS E-B is less than 50 ohms
 2. When the OHMS E-B is greater than 50 ohms
 3. When the OHMS E-B is less than 300 ohms
 4. When the OHMS E-B is greater than 300 ohms
- 4-71. While testing an in-circuit diode with the AN/USM-206A, the meter pointer deflects up-scale past the mid-scale point. What does this indicate?
1. The circuit impedance is over 25 ohms
 2. The diode is normal
 3. The diode is open
 4. The PNP/NPN switch is in the NPN position
- 4-72. The following current measurements were taken from the tips of four soldering irons to ground. Which iron is acceptable for use on transistorized circuits?
1. Iron #1, 0 microamperes
 2. Iron #2, 100 microamperes
 3. Iron #3, 500 microamperes
 4. Iron #4, 1 milliamperes
- 4-73. The following measurements were taken in the test circuits of four ohmmeter ranges. Which range is acceptable for use on transistorized circuits?
1. R x 1, 150 milliamperes
 2. R x 10, 15 milliamperes
 3. R x 1k, 2.25 milliamperes
 4. R x 10k, 0.225 milliamperes

Assignment 5

NTDS Unit Computer

Textbook Assignment: DS 3&2, Vol 1, NAVEDTRA 10201-B1, pages 79 through 102

Learning Objective: Recognize the basic functions and characteristics of the Digital Data Computer CP-642B/USQ-20(V) and specify the purpose of the various front panel controls.

- 5-1. Refer to figure 4-1 in the textbook. Which of the following chassis assignments is INCONSISTENT with the Digital Data Computer CP-642B/USQ-20(V)?
1. Input/output chassis - A1 through A4
 2. Logic (control and arithmetic) chassis - A5 through A7
 3. Thin-film memory chassis - A8
 4. Core memory chassis - A9 through A14
- 5-2. Which of the following is NOT a functional section of the CP-642B?
1. Control
 2. Arithmetic
 3. Card read/punch
 4. Memory
- 5-3. The input/output section of the CP-642B can communicate on (a) 16, 32 I/O channels with provisions for (b) speed interface with all I/O transfers in parallel.
1. (a) 16 (b) high or low
 2. (a) 32 (b) high or low
 3. (a) 16 (b) high
 4. (a) 32 (b) low
- 5-4. The CP-642B has a valid repertoire of (a) flexible single address 62, 80 instructions that may be modified by (b) index registers. 7, 16
1. (a) 62 (b) 16
 2. (a) 80 (b) 16
 3. (a) 62 (b) 7
 4. (a) 80 (b) 7
- 5-5. Which of the following characteristics of the CP-642B maintenance and control console is INCONSISTENT with its operation?
1. It permits manual initiation of various operations
 2. It displays an operational status of peripheral equipment
 3. It requires no monitoring during normal operation
 4. It displays a detailed report of the internal status of the computer

For items 5-6 through 5-9, match the function performed by the mode of operation given in column B with the mode switch listed in column A. Responses in column B are used only once.

<u>A. SWITCH</u>	<u>B. OPERATION</u>
5-6. Load	1. Allows the computer to execute one instruction at a time (usually for program debugging)
5-7. PHASE STEP	2. Allows the computer to be operated on a one clock phase at a time basis
5-8. OP STEP	3. Allows the computer to operate at normal high speed
5-9. RUN	4. Locks out all interrupts and places the computer in a condition for initial program loading from a selected peripheral device

For items 5-10 through 5-12, match the function performed by the various switches given in column B with the switch listed in column A. All responses in column B are not necessarily used.

<u>A. SWITCH</u>	<u>B. FUNCTION</u>
5-10. STOP switch	1. Selects the bootstrap program which will be executed during manual initiation in the LOAD mode
5-11. PHASE REPEAT switch	2. Directs the computer's activity after a program fault
5-12. AUTOMATIC RECOVERY switch	3. Active only if the PHASE STEP mode has been selected
	4. When operated, disables the high-speed operation of the computer

For items 5-13 through 5-15, match the function performed by the various switches or indicators given in column B with the switch or indicator listed in column A. All responses in column B are not necessarily used.

<u>A. SWITCH</u>	<u>B. FUNCTION</u>
5-13. MASTER CLEAR pushbutton	1. Glows green when the computer is in high-speed operation
5-14. LOCAL CONTROL indicator	2. Will reset most of the flip-flops in the computer, including the register indicators, when the computer is not in the RUN mode
5-15. RUN indicator	3. When lighted, it indicates that the computer is being operated from the maintenance panel
	4. Used to vary the speed of operation when the computer is in the PHASE STEP or OP STEP modes and the START-STEP/RESTART switch is in the up position

5-16. The (a) C register rotary two, four switches allow switching between (b) C registers and the four, eight C register indicator-switches.

1. (a) four (b) eight
2. (a) two (b) eight
3. (a) four (b) four
4. (a) two (b) four

5-17. Which of the following labeled register indicator-switches display the bit positions of the associated register?

1. K3, K2, C, and R
2. B, S, Q, and A
3. D, X, Z, and U
4. All of the above

5-18. How are the designator indicator-switches useful to a technician troubleshooting the CP-642B computer?

1. Faulty peripheral equipment is indicated
2. If an overtemperature condition prevails, the OVER TEMP WARNING is lighted
3. A timing point in a predetermined sequence of events is specified
4. All of the above

5-19. Which of the following is NOT an ACTIVE SEQ used to denote the sequence currently being performed?

1. Af
2. Bf
3. Cf
4. I/O

5-20. The g designator is used

1. to specify which master clock phase is currently active
2. with a repeat instruction to specify how the operation is to be repeated
3. to specify the channel number for external function acknowledges and output data acknowledges
4. for extended arithmetic operations

5-21. Refer to figure 4-2 in the textbook. There are a total of
 (a) I/O channels and
 16, 17, 18
 (b) I/O control signals from
 4, 8
 flip-flops that specify a particular function on the indicated channel.

1. (a) 16 (b) 8
2. (a) 18 (b) 4
3. (a) 16 (b) 4
4. (a) 17 (b) 8

For items 5-22 through 5-24, match the functions performed by the I/O indicator-switches given in column B with the indicators listed in column A. All responses in column B are not necessarily used.

<u>A. INDICATORS</u>	<u>B. FUNCTIONS</u>
----------------------	---------------------

- | | |
|---|--|
| 5-22. MN PRI indicators | 1. When set, indicates that the A final sequence has been enabled |
| 5-23. SUB PRI indicators | 2. Provide a visual indication of the current I/O operating mode |
| 5-24. TRANS (I/O translator) indicators | 3. Determine the operating mode (input or output) of the I/O section |
| | 4. Indicate which channel on which chassis has precedence |

5-25. Which of the following actions is INCONSISTENT with the operation of the disconnect circuit and its three associated switches?

1. The ADV P switch inhibits the incrementing of the P register
2. The B7 switch inhibits decrementing the B7 register during the repeat mode of operation
3. The RTC switch inhibits incrementing the real-time clock
4. None of the above

Items 5-26 and 5-27 are to be judged True or False.

5-26. The three selective jump switches allow automatic selection or omission of predetermined program sections in conjunction with the 61 or 65 instructions.

5-27. The selective stop switches allow program monitoring when used in conjunction with appropriate 61 and 65 instructions.

5-28. How many red stop indicators will normally glow at the end of a subroutine when some action is required by the operator, such as supplying additional data required for the solution of the problem?

1. One
2. Two
3. Three
4. Four

Learning Objective: Identify the basic instructions contained in a computer program including terms, symbols, and word formats.

5-29. What is the purpose of the large repertoire of instructions listed in table 4-2 in the textbook?

1. It provides the means for directing the computer to perform the mathematical operations involved in solving problems in real-time
2. It is used to instruct the computer to perform the data processing necessary for initiating and maintaining communications between, or control of, compatible external equipment
3. It provides the computer with constants, decision-making capabilities, and an I/O capability
4. All of the above

For items 5-30 through 5-33, associate the term or symbol meaning given in column B with the term or symbol listed in column A. Responses in column B are used only once.

<u>A. TERM</u>	<u>B. MEANING</u>
5-30	1. The initial content of α
5-31. Symbol α	2. The content of α
5-32. (α)	3. Any register or memory location
5-33. $(\alpha)i$	4. "means" or "implies that"

For items 5-34 through 5-37, associate the term or symbol meaning given in column B with the term or symbol listed in column A. Meanings in column B are used only once.

<u>A. TERM</u>	<u>B. MEANING</u>
5-34. $(\alpha)_n$	1. The lower 15-bits of α
5-35. α_L	2. The n^{th} bit of the content of α
5-36. Operand	3. Operand designator - lower 15-bits of the instruction word - U_L
5-37. y (lower case)	4. That which is operated upon

For items 5-38 through 5-40, associate the term or symbol meaning given in column B with the term or symbol listed in column A. All responses in column B are not necessarily used.

	<u>A. TERM</u>	<u>B. MEANING</u>
5-38.	Y (upper case)	1. The operand (regardless of source)
5-39.	<u>Y</u>	2. The contents of memory address Y
5-40.	<u>LY</u> (α)	3. The logical product of <u>Y</u> and the contents of a register or memory location
		4. Address of the operand - usually formed by $y +$ (index register)

5-41. An instruction word for the CP-642B computer is made up of parts called (a) bits, and each of these designators specify a (b) general, particular function for the computer to perform for that specific instruction.

1. (a) bits (b) particular
2. (a) designators (b) particular
3. (a) bits (b) general
4. (a) designators (b) general

5-42. The CP-642B computer uses a fixed instruction word length of (a) 15-bits, 30-bits divided into (b) three, five designators.

1. (a) 15-bits (b) three
2. (a) 15-bits (b) five
3. (a) 30-bits (b) five
4. (a) 30-bits (b) three

Refer to table 4-3 in the textbook. For items 5-43 through 5-46, match the designator interpretation given in column B with the designator listed in column A. Responses in column B are used only once.

	<u>A. DESIGNATOR</u>	<u>B. INTERPRETATION</u>
5-43.	Designator f	1. Specifies which B register, if any, will be used to modify the y operand designator (same for Format I and Format II)
5-44.	Designator j, \hat{j}	2. Specifies for the function code exactly where the operand will come from before, and/or where it will be stored after the instruction is executed, and whether it is 15- or 30-bits in length (same for Format I and Format II)
5-45.	Designator k, \hat{k}	3. Specifies the general operation to be performed by the computer (same for Format I and Format II)
5-46.	Designator b	4. Used for jump or skip operations, index register specifications, and repeat status interpretations for Format I and specifies the I/O channel number for Format II

Learning Objective: Identify the primary signal transfer paths between the control section, arithmetic section, input/output section, and memory section using the block diagram shown in textbook figure 4-3.

5-47. What section of the CP-642B computer obtains instruction words and operands from the memory section, directs arithmetic functions, and makes certain decisions?

1. Memory
2. Input/output
3. Control
4. Arithmetic

5-48. Which of the following operations is performed by the arithmetic section?

1. Timing of computer operations
2. Location of stored information
3. Initiation of instructions
4. Logic operations specified by the instruction word

5-49. Data used during an arithmetic operation is stored in what section?

1. Memory
2. Input/output
3. Control
4. Arithmetic (in registers)

5-50. The I/O section contains a priority system for channel activation, allowing the (a) _____ numbered channel lowest, highest the highest priority and a sub-priority dependent upon the function to be performed in (b) _____ order an ascending, a descending of priority; real-time clock, external interrupt, external function, output data, and input data.

1. (a) Lowest (b) descending
2. (a) Highest (b) ascending
3. (a) Highest (b) descending
4. (a) Lowest (b) ascending

5-51. In what section are programs stored?

1. Input/output
2. Memory
3. Control
4. Arithmetic

5-52. The storage locations of the CP-642B computer contain (a) $\frac{32,672}{32,768}$ available addresses out of the main memory, (b) $\frac{56,64}{32,64}$ addresses for the control memory, and (c) $\frac{32,64}{32,64}$ addresses for the selected bootstrap memory.

1. (a) 32,672 (b) 64 (c) 32
2. (a) 32,768 (b) 56 (c) 32
3. (a) 32,672 (b) 64 (c) 64
4. (a) 32,768 (b) 56 (c) 64

5-53. The bootstrap memory is one which is

1. hardwired by the manufacturer into the computer circuitry
2. fed into the computer memory by a peripheral device
3. loaded manually into the computer memory and consists of a subroutine which may be used many times
4. loaded manually into the computer memory and comprises the main body of instructions

5-54. Which of the following operations can NOT be performed with bootstrap memory?

1. Retention of numerical constants
2. Retention of instructions
3. Bootstrap memory storage
4. Main memory or control memory storage

Learning Objective: Specify the various operations performed by the control section of the CP-642B computer while referring to the functional block diagram shown in textbook figure 4-4.

5-55. Which of the following actions is INCONSISTENT with manual operation of the control section?

1. The control section supplies timing, translation, and sequencing required for all computer functions
2. Lighted indicators are kept under surveillance to isolate possible logic malfunctions
3. The computer performs instructions of an entire program at a high rate of speed, stopping only at programmed stops
4. Circuit conditions are controlled by the use of pushbutton switch-indicators and control switches

5-56. Which register in the control section holds the instruction that is presently being executed after receiving its input from the memory data register (Z)?

1. U
2. R
3. P
4. B

5-57. What is the octal value of f if bits 2^{28} , 2^{27} , and 2^{25} are set (1) and bits 2^{29} , 2^{26} , and 2^{24} are clear (0)?

1. 011010
2. 282725
3. 32
4. 23

5-58. Which of the following statements is INCONSISTENT concerning instruction word translation and interpretation?

1. Translation of the branch condition designator j works in the same manner as the f code translator and produces enables to appropriate circuits throughout the computer
2. The k translator translates for the value of the k designator and combines this value with values of f to provide specific function translation
3. The b designator specifies which of the seven B registers (addresses in the control memory) is used for indexing and incrementing or indexing and decrementing
4. The operand address designator y is the upper 15 bits of the instruction word stored in U

5-59. For store instructions, what term specifies the memory location for storage when $k = 1, 2, 3, 5, 6, \text{ or } 7$?

1. $y - Bb$
2. $Y + Bb$
3. $y + Bb$
4. $Y - Bb$

5-60. What three values of k are NOT used for replace instructions?

1. 1, 2, and 3
2. 4, 5, and 6
3. 0, 4, and 7
4. 2, 4, and 6

5-61. Which register and its associated translator select the specific memory address?

1. S
2. R
3. P
4. B

5-62. Refer to figure 4-5 in the text-book. What is the approximate L (low) time of each clock phase within the master clock period?

1. 680 nanoseconds (ns)
2. 340 ns
3. 170 ns
4. 130 ns (measured at the 50% amplitude points of the clock phase waveform)

Item 5-63 is to be judged True or False.

5-63. Computer controls can be inhibited from a remote control panel as well as by the console controls.

5-64. The initial main timing (MTi) consists of (a) flip-flops and 6, 12 when operating with Ai enables from (b) sequence control, command enables the next instruction is read from the selected memory address and placed in U.

1. (a) 6 (b) command enables
2. (a) 6 (b) sequence control
3. (a) 12 (b) command enables
4. (a) 12 (b) sequence control

5-65. Which of the following functions is NOT characteristic of final main timing (MTf)?

1. It operates with enables from sequence control
2. It provides timing for the store portion of replace and return jump instructions
3. It provides timing for miscellaneous functions of instructions
4. It generates command enables to allow sequential control of computer operation

5-66. The sequence control consists of (a) flip-flops which six, eight includes an enable flip-flop that allows operation to (b) begin, stop and recycle if certain conditions exist.

1. (a) eight (b) begin
2. (a) eight (b) stop
3. (a) six (b) begin
4. (a) six (b) stop

For items 5-67 through 5-70, associate the function performed by sequence control given in column B with the sequence listed in column A for automatic operation of the computer. Responses in column B are used only once.

	<u>A. SEQUENCE</u>	<u>B. FUNCTION</u>
5-67.	MT with A	1. Provides timing to perform the arithmetic and logical functions specified by the current instruction
5-68.	MT with B	2. Performs the store functions for certain store instructions
5-69.	C sequence	3. Reads the next instruction and performs preliminary operation modification
5-70.	MT with D	4. Obtains the operand and initiates arithmetic functions

5-71. Which of the following subsequences are initiated by the C sequence to perform the function indicated?

1. Read Y (obtain specified operand)
2. Store Y (control the store function)
3. Interchange AQ (controls interchange of contents of A and Q)
4. All of the above

5-72. Which of the following functions of the control adder is INCONSISTENT with its usage?

1. Normal adder operation allows end-around carries to produce a counter circuit
2. During adder operations $(+1) + (-1) = +1$
3. The control adder is used with the registers of the control section
4. During counter operations $(+1) + (-1) = +0$

5-73. The program address register P is used to (a) the read, store address of the memory location to be referenced and through the use of the (b) register and the R, S control adder, the contents of P are incremented to provide successive memory addressing.

1. (a) read (b) R
2. (a) store (b) R
3. (a) read (b) S
4. (a) store (b) S

5-74. Which of the following characteristics of the control register B is INCONSISTENT with its operation?

1. It is used to increment the contents of P through the use of the SET B = +1 command
2. It functions through the control adder as an adder input register to update the contents of UL
3. It works in conjunction with and serves the same basic purpose as the seven B registers contained in the memory section
4. It functions through the control adder as an adder input register to update the contents of Z

5-75. Inputs to the R register are from (a) the P, the Z, either the P or Z register with an output to (b) the control adder for modification by the contents of the B, U register.

1. (a) P (b) B
2. (a) Z (b) U
3. (a) either the P or Z (b) B
4. (a) either the P or Z (b) U

Assignment 6

NTDS Unit Computer

Textbook Assignment: DS 3&2, Vol 1, NAVEDTRA 10201-B1, pages 103 through 124

Learning Objective: Identify the various operations performed by the arithmetic section of the CP-642B computer while referring to the functional block diagram shown in textbook figure 4-6.

- 6-1. Which of the following sequences from the control section primarily commands the arithmetic section functions?
1. D
 2. C
 3. B
 4. A
- 6-2. For positive numbers to be manipulated, the sign bit (bit 29) is (a), for negative numbers the sign bit is (b), and for square root operations no sign bit is used and the entire 30-bits are treated as a (c) number.
- positive negative,
1. (a) clear (0)
(b) set
(c) positive
 2. (a) set (1)
(b) clear
(c) positive
 3. (a) clear (0)
(b) set
(c) negative
 4. (a) set (1)
(b) clear
(c) negative
- 6-3. Which of the following functions take place in the A register (accumulator)?
1. It holds the augend prior to and the sum after the add operation
 2. It performs the ADD Q and the SUBTRACT Q operations
 3. It holds the minuend prior to and the difference after the subtract operation
 4. 1 and 3 above
- 6-4. Which arithmetic section register holds the addend or subtrahend during add or subtract operations?
1. A
 2. D
 3. W
 4. X
- 6-5. Arrange the information given below in the sequence in which it occurs in the arithmetic section registers.
- A. X and D are combined
 - B. A is transferred to X
 - C. X and D result is transferred to A
 - D. Augend and addend are contained in A and D respectively
1. A, B, C, and D
 2. D, C, B, and A
 3. D, B, A, and C
 4. C, A, D, and B

- 6-6. Which of the following registers are combined to hold the product after multiplication operations or to hold the dividend prior to division operations?
1. A and X
 2. Q and W
 3. A and Q
 4. A and W
- 6-7. Which of the following characteristics of the arithmetic section is INCONSISTENT with the selector and register functions?
1. The K registers (K1, K2, K3) function as a shift counter for all arithmetic operations that involve shifts (multiply, divide, square root, and shift instructions)
 2. The W register has an indicator which allows the operator to inspect the contents of the register during debugging and maintenance operations
 3. The S1 and S2 selectors are control gates that allow an increased number of inputs to A and W to be used
 4. The X and W registers are used for exchange of data within the arithmetic section and for communicating with the remaining sections of the computer
- 6-8. The subtractor is a logic matrix that combines the contents of the
(a) registers to
 A and D, X and D
 produce the difference or logical sum of their outputs and it uses
(b)
binary, one's complement binary arithmetic.
1. (a) X and D
 (b) One's complement binary
 2. (a) A and D
 (b) One's complement binary
 3. (a) X and D
 (b) Binary
 4. (a) A and D
 (b) Binary
- Refer to table 4-5 in the textbook while answering items 6-9 through 6-11.
- 6-9. What half subtract (HS) result is formed by the subtractor for the operation 010011 - 100111?
1. 000101
 2. 010011
 3. 110100
 4. 111010
- 6-10. What borrows are produced by the subtractor for the operation 010011 - 100111?
1. 111011
 2. 110001
 3. 011001
 4. 010011
- 6-11. Which of the following combinations will enable borrows to be propagated?
1. $X \neq D$
 2. $X = D = 1$
 3. $X = D = 0$
 4. Any of the above
- 6-12. Refer to figure 4-8 in the textbook. If section IV of the subtractor generates a borrow and section V cannot satisfy the borrow, to which of the following sections will the request be propagated?
1. I
 2. II
 3. III
 4. None of the above
- Learning Objective: Identify the characteristics and functions of the memory section of the CP-642B computer including the special functions and types of storage for the main, control, and bootstrap memories.*

For items 6-13 through 6-15, match the functions of the memory systems within the memory section of the CP-642B computer given in column B with the memory system listed in column A. All responses in column B are not necessarily used.

A. SYSTEM	B. FUNCTION
6-13. Main memory	1. A high-speed thin-film memory which serves as the storage medium for indexing and input/output control
6-14. Control memory	2. Contains 32,768 possible 30-bit locations
6-15. Bootstrap memory	3. A core storage memory which is used for the storage of programs, constants, and input/output data
	4. Used for the storage of critical instructions and constants, and provides automatic recovery in the event of program failure, and the automatic initial loading of programs

6-16. When data is referenced from the magnetic core storage system, a portion of which is contained in each memory chassis in a _____ (a) _____ manner nonsequential, sequential and the data is _____ (b) _____ dumped, retained by the system when power is removed from the computer.

- (a) sequential
(b) dumped
- (a) nonsequential
(b) retained
- (a) sequential
(b) retained
- (a) nonsequential
(b) dumped

6-17. Which of the following storage locations is reserved for the main memory? Refer to table 4-4 in the textbook.

- 00000₈ through 00077₈
- 00200₈ through 00537₈
- 00600₈ through 77777₈
- All of the above

6-18. In the main memory system, which of the following specifies one of the storage locations when a specific storage location in memory is referenced?

- The S translator
- The Z register
- The S register
- Memory control

6-19. What is the total approximate time required for one main memory reference and the delivery of the data from storage?

- 1 μs
- 2 μs
- 5 μs
- 4 μs

6-20. The magnetic cores require a current of _____ (a) _____ mA for a period of _____ (b) _____ μs to switch them from one stable magnetic state (1 or 0) to the other.

- (a) 200 (b) .8
- (a) 400 (b) 1.2
- (a) 200 (b) 1.2
- (a) 400 (b) .8

6-21. Refer to figures 4-10 and 4-11 in the textbook. Which of the following lines pass through each magnetic core?

- The X and Y read/write lines
- Either a vertical or horizontal inhibit line;
- A diagonal sense line
- All of the above

6-22. The state of magnetization of a core is induced by the current in the

1. diagonal sense line
2. X and Y drive lines
3. vertical drive line
4. horizontal drive line

Items 6-23 and 6-24 are to be judged True or False.

6-23. If the core was originally in the 0 state, the magnetizing force will cause a flux change in the core to occur and the output state will change to 1.

6-24. The pulses associated with the restore function are called write or restore pulses and are of the same polarity as the read pulses.

6-25. A memory plane has $\frac{(a)}{16,384; 32,768}$ memory cores which are located at the intersection of the horizontal and vertical conductors and it requires $\frac{(b)}{\text{two, four}}$ memory planes to store all the main memory addresses for one bit position.

1. (a) 16,384 (b) two
2. (a) 16,384 (b) four
3. (a) 32,768 (b) two
4. (a) 32,768 (b) four

Refer to figures 4-13 and 4-14 in the textbook while answering items 6-26 and 6-27.

6-26. A memory plane is divided into $\frac{(a)}{\text{four, eight}}$ quadrants and each quadrant contains a $\frac{(b)}{64 \times 64, 128 \times 128}$ array of magnetic cores.

1. (a) four (b) 128×128
2. (a) eight (b) 128×128
3. (a) four (b) 64×64
4. (a) eight (b) 64×64

6-27. How are the inhibit lines of a memory plane threaded?

1. Horizontally for the upper level and vertically for the lower level
2. Horizontally for quadrants 1 and 2 upper level, 5 and 6 lower level, and vertically for the remaining quadrants
3. Vertically for quadrants 0 and 3 upper level, 4 and 7 lower level, and horizontally for the remaining quadrants
4. Vertically for quadrants 1 and 2 upper level and 5 and 6 lower level and horizontally for quadrants 0 and 3 upper level and 4 and 7 lower level

6-28. Which of the following characteristics of a memory stack is INCONSISTENT with its design or function? Refer to figure 4-15 in the textbook.

1. The storage elements of the main memory are contained in five memory stacks, each stack containing all the 32,672 addresses required for the storage of a six-bit segment of a 30-bit word
2. A memory stack contains 12 memory planes (six upper level and six lower level), two endboard assemblies, and a centerboard
3. Access circuits to a memory stack are made through the centerboard and the endboard
4. The diode modules mounted on the endboard assemblies are used to enable the drive lines

6-29. For core selection, a (a) coincident

half-amplitude, full-amplitude current pulse is generated in each selected row and column, which results in the core that has been addressed receiving

an attenuated, a full-amplitude pulse. Refer to textbook figure 4-16.

1. (a) Full amplitude
(b) An attenuated
2. (a) Coincident half-amplitude
(b) A full-amplitude
3. (a) Full-amplitude
(b) A full-amplitude
4. (a) Coincident half-amplitude
(b) An attenuated

6-30. If read pulses are applied when the selected core is in the 0 state, a voltage of (a) 10 mV maximum, (b) 55 mV peak is induced in the (b) line and the core inhibit, sense magnetization (c) is changed to 1, (c) remains 0

1. (a) 55 mV peak
(b) Sense
(c) Remains 0
2. (a) 10 mV maximum
(b) Inhibit
(c) Is changed to 1
3. (a) 55 mV peak
(b) Inhibit
(c) Is changed to 1
4. (a) 10 mV maximum
(b) Sense
(c) Remains 0

Refer to figure 4-17 in the textbook while answering items 6-31 and 6-32.

6-31. Which of the following circuits is/are NOT part of the S translator?

1. The inhibit selector
2. The sense amplifiers
3. The X and Y line selectors
4. The X and Y group selectors

6-32. Use the information given below to arrange in sequence the output of the sense line.

- A. Each sense circuit connects the output of the sense windings in a bit-plane (two memory planes) to a sense amplifier
- B. The sense amplifiers connect the outputs from the memory planes to the sense register
- C. The sense register connects to the Z register

1. B, C, A
2. C, A, B
3. A, B, C
4. B, A, C

6-33. The inhibit circuits are used during the (a) read, write cycle to prevent writing into a wrong address in (b) memory, storage by counteracting X and Y drive line pulses for core selection.

1. (a) Write (b) storage
2. (a) Read (b) storage
3. (a) Write (b) memory
4. (a) Read (b) memory

6-34. The control memory is a 64 word, 30-bit, (a) core, thin-film memory with an access time of (b) 333 ns, (c) and a total cycle time of (c) 4 μ s, 5 μ s, 667 nx, 5 μ s.

1. (a) Thin-film
(b) 333 ns
(c) 667 nx
2. (a) Thin-film
(b) 4 μ s
(c) 5 μ s
3. (a) Core
(b) 333 ns
(c) 5 μ s
4. (a) Core
(b) 4 μ s
(c) 677 nx

Items 6-35 and 6-36 are to be judged True or False. Refer to figures 4-18 and 4-19 in the textbook.

6-35. A thin-film stack has a total of seven planes, consisting of a unifluxor plane, four thin-film planes, and two transformer diode planes.

6-36. The thin-film planes in a stack consist of an upper and lower cover, an upper and lower wiring array, and a spacer with four substrates that separates the wiring arrays.

6-37. The direction of the preferred axis of a thin-film magnetic device is determined during its construction by the

1. pattern formed by the film spot
2. orientation of the film spot on the substrate
3. direction of an applied magnetic field
4. thickness of the film spot

6-38. The torque which aligns the magnetism in a film spot parallel to its preferred axis in the absence of external stimuli is produced by the

1. bit current
2. residual magnetic field
3. longitudinal field
4. traverse field

6-39. Refer to figure 4-20 in the textbook. Which of the following magnetic field vectors determine the direction of the final stable state of magnetization of the film spot?

1. The direction of A
2. The direction of B
3. The direction of C
4. None of the above

Refer to figure 4-21 in the textbook while answering items 6-40 and 6-41.

6-40. What conditions in the word and bit lines initiate the storing of a "1" in a film spot?

1. No current in the word lines and current in the bit line
2. Current in the word lines and no current in the bit lines
3. Current in the word line and bias in the bit lines
4. Current in the word lines and bit current in the bit lines

6-41. For thin-film memory, reading a location in which a "1" has been stored produces

1. a "1" state in the address spot
2. a zero output from the "and" circuit
3. an induced voltage in the sense lines
4. a zero output from the sense amplifier

Refer to figure 4-22 in the textbook while answering items 6-42 and 6-43.

6-42. In control memory word selection, the activated word drive line (a) _____ all 30-bits nullifies, switches to determine their output and the word current is applied in the (b) _____ direction opposite, same during the read and write cycle.

1. (a) nullifies (b) same
2. (a) switches (b) opposite
3. (a) nullifies (b) opposite
4. (a) switches (b) same

- 6-43. During the write cycle, what causes the bit current to have a negligible effect on the spots that have not been selected by a word current?
1. It produces a magnetic field in the opposite direction
 2. It produces a magnetic field in the same direction
 3. It produces a magnetic field in a traverse direction
 4. It cancels the magnetic field

Item 6-44 is to be judged True or False.

- 6-44. The basic difference between a write and a restore operation is whether or not the information is written back into memory the same as it was read out or whether it is new information.

- 6-45. Which computer section supplies the address to determine which word line is activated each time control memory is initiated (which in turn performs a complete read/write cycle)?

1. Control
2. Arithmetic
3. Memory
4. Input/output

- 6-46. During the read portion of the cycle, the data register (Z0) is (a) and during the (b) portion of the write, restore cycle, the contents of the Z0 register are stored in the specified film stack locations.

1. (a) cleared (b) restore
2. (a) set (b) write
3. (a) set (b) restore
4. (a) cleared (b) write

- 6-47. When the sense amplifiers are strobed and the outputs are gated in the Z0 register, what is the timing pulse called that is used to ensure that the optimum signal level is obtained before data is transferred?

1. Holding pulse
2. Standard pulse
3. Strobe pulse
4. Amplifier pulse

Refer to figure 4-24 in the textbook while answering items 6-48 through 6-50.

- 6-48. When the sense amplifiers are not strobed and the film stack outputs are not gated into the Z0 register, to which of the following parts of the word may the strobe disable be applied?

1. The upper half
2. The lower half
3. The entire word
4. Any of the above

- 6-49. During a read operation, (a) one set, _____ of the sense amplifiers both sets are (b) and disabled, enabled (c) word is one-half the, the entire gated into the Z0 register.

1. (a) both sets
(b) enabled
(c) the entire
2. (a) one set
(b) disabled
(c) one-half the
3. (a) both sets
(b) enabled
(c) one-half the
4. (a) one set
(b) disabled
(c) the entire

- 6-50. Data to be written into a control memory location during a write operation would be placed into which portion of Z0 disable?

1. The lower 15-bits
2. The upper 15-bits
3. All 30-bits
4. Any of the above

Refer to figure 4-25 in the textbook while answering items 6-51 through 6-58.

- 6-51. The control memory address register (S0) is a (a) seven-bit, 30-bit register which is loaded by the control section S0 selector (b) after, at the same time the control memory is initiated.
1. (a) seven-bit
(b) after
 2. (a) seven-bit
(b) at the same time
 3. (a) 30-bit
(b) after
 4. (a) 30-bit
(b) at the same time
- 6-52. Which of the following statements is INCONSISTENT with the functions of the two word current generators (WCG) or their relationship with other circuits in control memory addressing?
1. The S0 address bit 2^6 determines which WCG is selected
 2. Address group 100-177 selects control memory, while bootstrap addresses 540-577 select Program I or Program II
 3. The WCG outputs enable the word current diverters (WCD)
 4. The primary current for the transformer selectors is supplied by the line charger

Items 6-53 and 6-54 are to be judged True or False.

- 6-53. The primaries of the transformer selectors for bootstrap and control memory are selected by two word current diverters.
- 6-54. The word current diverters are selected by the outputs from the word current generators and bits 03, 04, and 05 of the S0 register.

- 6-55. The eight line transformer selectors (LTS) enable one of the eight word line transformers from the group designated by the
1. bits 00, 01, and 02 of S0
 2. word current timing
 3. transformer selectors
 4. octal translators
- 6-56. The 128 word line transformers generate the word current which is used to (a) read and write, read or write in the control memory, and to (b) read, write only in the bootstrap memory.
1. (a) read and write (b) read
 2. (a) read or write (b) write
 3. (a) read or write (b) read
 4. (a) read and write (b) write
- 6-57. Which of the following actions is INCONSISTENT with the functions of the control section?
1. It supplies the address and sets the inhibit flip-flops which determine to what portion of the data that the strobe disables apply
 2. It supplies computer timing to cycle completion once the memory cycle has been initiated
 3. It initiates control memory
 4. It loads Z0 for the write operation and samples the contents of Z0 for the read operation

6-58. Which of the following statements is INCONSISTENT concerning the functions of the memory cycle?

1. The word timing and bit timing flip-flops control the enabling and disabling of the word and bit lines
2. The specified word line is enabled before the read portion of the cycle
3. The word line remains enabled only until the completion of the read portion of the cycle
4. The bit lines are enabled only during the write/restore portion of the cycle

Item 6-59 is to be judged True or False.

6-59. A unifluxor memory has a non-destructive readout type of storage and is used primarily for program fault recovery.

6-60. Each program card in bootstrap memory contains (a) words of (b) bits each.
 $\frac{32, 64}{15, 30}$

1. (a) 32 (b) 15
2. (a) 32 (b) 30
3. (a) 64 (b) 15
4. (a) 64 (b) 30

Item 6-61 is to be judged True or False.

6-61. The principle used for the storage of data in the bootstrap memory is that a current through a conductor will induce a nearly equal and parallel current in another conductor placed very close and parallel to it.

6-62. Which of the belt buckles in figure 6-1 would result in no output?

1. A
2. B
3. C
4. A and B

6-63. Which of the belt buckles in figure 6-1 would represent a 1?

1. A
2. B
3. C
4. B and C

6-64. Which of the belt buckles in figure 6-1 would represent a zero?

1. A
2. B
3. C
4. A and C

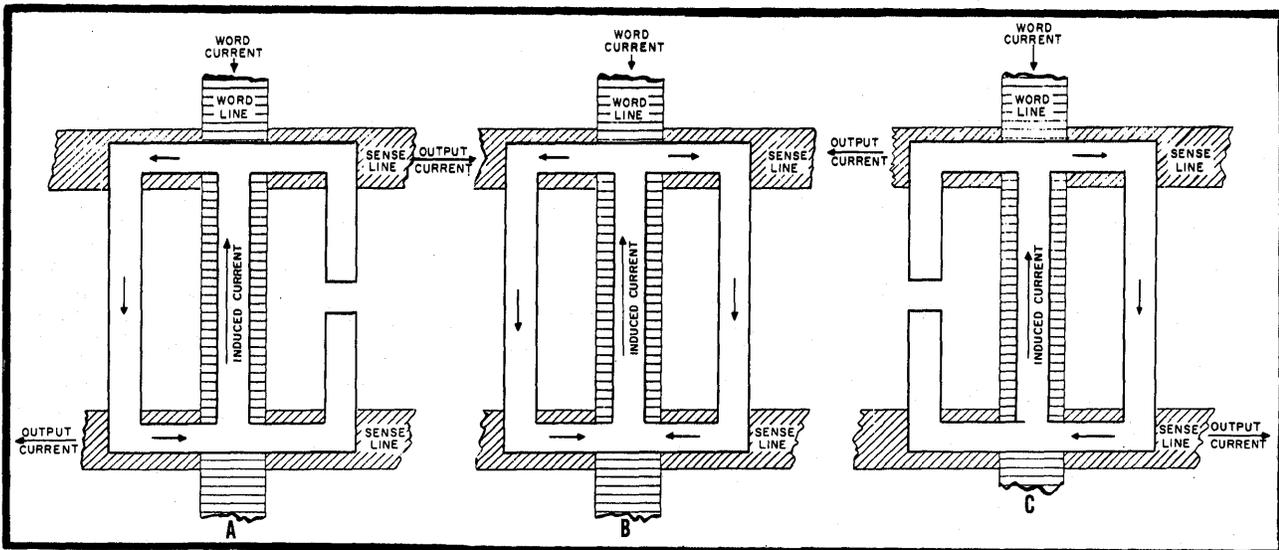


Figure 6-1.-Belt Buckles

Items 6-65 and 6-66 are to be judged True or False.

6-65. In the load mode of operation, the PROGRAM I/PROGRAM II toggle switches are used to select either of the two programs.

6-66. Memory stacks are constructed in a manner which makes repair by field maintenance personnel a routine task in the event of stack damage.

Assignment 7

NTDS Unit Computer and NTDS Peripheral Equipment

Textbook Assignment: DS 3&2, Vol 1, NAVEDTRA 10201-B1, pages 124 through 145

Learning Objective: Recognize the various functions performed by the input/output section of the CP-642B computer. Identify the various circuits and devices of the input/output section using a block diagram. Determine the signal paths between the input/output section and peripheral equipment and the signal paths between two computers.

7-1. The transfer of data to and from the computer is via (a) input 16, 32 and (b) output channels with 8, 16 data being transferred in a (c) parallel mode. 15-bit, 30-bit

1. (a) 16 (b) 8 (c) 15-bit
2. (a) 32 (b) 16 (c) 30-bit
3. (a) 16 (b) 16 (c) 30-bit
4. (a) 32 (b) 8 (c) 15-bit

Items 7-2 through 7-4 are to be judged True or False.

7-2. By changing the fast interface/slow interface circuit cards, any or all of the four chassis can be designated a high-speed chassis or a slow-speed chassis.

7-3. The input/output section functions synchronously with the computer program.

7-4. Command transfers in the input mode are referred to as external function words, and in the output mode as interrupts.

For items 7-5 through 7-7, match the basic priority purpose given in column B with the basic priority system listed in column A. All responses in column B are not necessarily used.

<u>A. PRIORITY</u>	<u>B. PURPOSE</u>
7-5. Function priority	1. Sends a signal to the external equipment indicating that a request has been processed
7-6. Group priority	2. Used to establish which request or interrupt is to be processed first
7-7. Channel priority	3. Used to establish which channel on a particular chassis will be granted priority
	4. Used to establish which chassis containing a request for priority will be acknowledged first

7-8. Input data words (peripheral units into the computer) and output data words (from the computer to peripheral units) represent (a) alpha, numeric, data and this data alphanumeric transfer is in a (b) 15-bit, 30-bit parallel mode.

1. (a) alpha (b) 15-bit
2. (a) numeric (b) 30-bit
3. (a) alphanumeric (b) 30-bit
4. (a) alphanumeric (b) 15-bit

7-9. Control words specify the type of operation that is to be performed and are sent from the computer to the

1. peripheral units
2. input selectors
3. arithmetic section
4. control section

7-10. Interrupt signals, which accompany external interrupt words, are sent from the

(a) computer, control section, peripheral units (b) to the computer, control section, peripheral units

and indicate to the computer a special condition which exists on a corresponding I/O channel.

1. (a) control section (b) peripheral units
2. (a) control section (b) computer
3. (a) peripheral units (b) control section
4. (a) peripheral units (b) computer

Refer to figure 4-30 in the textbook while answering items 7-11 through 7-17.

For items 7-11 through 7-14, match the functions performed in an input/output channel given in column B with the channel circuit or device listed in column A. Responses in column B are used only once.

	<u>A. CHANNEL</u>	<u>B. FUNCTION</u>
7-11.	I/O control circuits	1. Provides the necessary gating, through program generated enables, for signals and data from the I/O section to memory
7-12.	Input data gates	2. Provides translation to establish the priority of the input signal and the priority of the channel requesting the I/O function
7-13.	I/O selector	3. Provide the gating, timing, and monitor control for I/O data transfers
7-14.	I/O translator	4. Provide a storage medium for input data to the computer until such time as the computer logic is capable of processing this data as directed by the I/O control circuitry

7-15. The channel selector always grants priority to the (a) lowest, highest -numbered channel within

a group and the group selector always grants priority to the (b) lowest, highest -numbered group.

1. (a) lowest (b) highest
2. (a) highest (b) highest
3. (a) highest (b) lowest
4. (a) lowest (b) lowest

7-16. Which of the following function priorities is NOT in the proper sequence as evaluated by the priority and access circuits?

1. Advance real-time clock
2. External interrupt
3. Input monitor interrupt
4. Output monitor interrupt

7-17. Which of the following registers is provided for each group or chassis to store output data until the associated peripheral device is capable of processing it?

1. C
2. D
3. U
4. Z

Refer to figure 4-31 in the textbook while answering items 7-18 through 7-22.

7-18. Each cable connecting input channels to the computer from peripheral equipment contains (a) 16, 30 input data lines and (b) 4, 8 input control lines.

1. (a) 16 (b) 4
2. (a) 16 (b) 8
3. (a) 30 (b) 4
4. (a) 30 (b) 8

Refer to table 4-6 in the textbook while answering items 7-19 through 7-22.

7-19. Which of the following sequence of events occur immediately after the computer sets the output data acknowledge line, indicating that the data is ready for sampling?

1. The computer initiates output buffer for given channel
2. The peripheral equipment samples the data line
3. The peripheral equipment detects the output data acknowledge
4. The computer places information on the data lines

7-20. Which of the following sequence of events occur immediately before the computer detects the input data request?

1. The computer samples the data lines at its convenience
2. The peripheral equipment senses the input acknowledge line
3. The peripheral equipment places a data word on the data lines
4. The peripheral equipment sets the input data request line to indicate that it has data ready for transmission

7-21. Which of the following sequence of events occur immediately after the computer places the external function code on the data lines?

1. The peripheral equipment detects the external function acknowledge and samples the external function code
2. The computer sets the external function acknowledge line to indicate that the external function is ready for sampling
3. The peripheral equipment sets the external function request line when it is ready to accept the external function code
4. The computer detects the external function request

7-22. Which of the following sequence of events occur immediately before the computer detects the external interrupt request signal and at its convenience, stores the external interrupt word?

1. The computer sets the external interrupt enable when it is ready to accept an external interrupt for a given channel
2. The computer drops the external interrupt enable
3. The peripheral equipment sets the external interrupt request line to indicate that an external interrupt code is on the data lines
4. The peripheral equipment detects the external interrupt enable

Refer to figure 4-32 and table 4-7 in the textbook while answering items 7-23 and 7-24.

7-23. For intercomputer command word transfer, which of the following sequence of events occur immediately after computer B recognizes the external function acknowledge as an external interrupt request and accepts the command word?

1. Computer B clears the external interrupt enable line, stores the command word in the status word location, and sets the input acknowledge line
2. Computer A recognizes the external interrupt enable as an external function request and places the external function code on the data lines
3. Computer A recognizes the input acknowledge as a resume and clears the external function acknowledge line
4. Computer B sets the external interrupt enable when it is ready to accept a command word from computer A

7-24. For intercomputer data transfer, which of the following sequence of events occur immediately before computer A sets the ready line to indicate that the data is on the lines?

1. Computer B recognizes the ready signal as an input data request signal and, at its convenience, accepts the data word
2. Computer A places data on the data lines
3. Computer B sets the input acknowledge line
4. Computer B initiates an input buffer, and computer A initiates an output buffer for the required channel

Item 7-25 is to be judged True or False.

7-25. Input/output operations must be substantiated by program control throughout the buffer process.

7-26. Which of the following actions are provided by program control to initiate an input/output function?

1. The program sets the active flip-flops for the specified channel
2. The program stores a control word in a fixed memory location
3. The program sets the active flip-flops for the desired function
4. All of the above

7-27. Concerning input data request (IDR), which of the following input/output sequences occurs immediately after enables are supplied to write the word on the data lines into memory?

1. An input acknowledge signal is sent to the peripheral device
2. The control word is written back into its assigned address
3. The active flip-flop is cleared if this is the last word to be read in
4. The control word is updated

- 7-28. Concerning the output data request (ODR), which of the following sequence of events occurs immediately before the word is read from the address specified and placed on the data lines?
1. The control word is written back into its assigned address
 2. An output acknowledge signal is sent to the peripheral device
 3. The active flip-flop is cleared if this is the last word to be transferred
 4. The control word is updated

- 7-29. The external interrupt request (EIR) flip-flop is (a) cleared, set by master control or program control and the external interrupt hold (EI Hold) flip-flop is (b) cleared (also), set (also) by master clear or program control.
1. (a) cleared (b) cleared also
 2. (a) cleared (b) set
 3. (a) set (b) cleared
 4. (a) set (b) set also

Items 7-30 and 7-31 are to be judged True or False.

- 7-30. The output of the EI request gate is transmitted to the channel priority register to determine priority of the channel.
- 7-31. Internal interrupts serve primarily to synchronize the computer program with initiation of input/output transfers and to signal the occurrence of an error.
- 7-32. Which of the following is a primary function of interrupts from external sources?
1. To transmit or receive data
 2. To notify the computer when an error has occurred
 3. To synchronize the computer program with the readiness of peripheral devices (or other computers)
 4. All of the above

- 7-33. Internal interrupts are generated when
1. inhibit flip-flops are set and monitor flip-flops are clear
 2. monitor flip-flops are set and inhibit flip-flops are clear
 3. monitor and inhibit flip-flops are set
 4. monitor and inhibit flip-flops are clear

For items 7-34 through 7-36, match the functions performed by the various operating modes given in column B with the operating modes listed in column A. All responses in column B are not necessarily used.

	<u>A. MODES</u>	<u>B. FUNCTIONS</u>
7-34.	Input mode	1. Holds the word in the output register associated with the specified channel until a resume signal is received or until a specified time has elapsed
7-35.	Output mode	2. Initiated by a programmed instruction when either the computer receives an external interrupt and the associated external interrupt code word or when it receives an input data request and the associated data word
7-36.	Interrupt mode (internal and external)	3. Initiated when the programmed instruction specifies a data transmission to a peripheral device
		4. Causes the computer to discontinue the running program and to execute the instruction located in one of the permanently assigned entrance registers

For items 7-37 and 7-38, match the functions performed by the operating modes given in column B with the operating modes listed in column A. All responses in column B are not necessarily used.

A. MODES	B. FUNCTIONS
7-37. Buffer with monitor	1. Causes the computer to discontinue the normal sequence and to execute the instructions obtained from the core memory address
7-38. Buffer without monitor	2. Data words are transferred sequentially, starting at a given address through a terminal address on the specified input or output channel with no monitor interrupts occurring at the completion of the buffer
	3. Caused by either executing an illegal function code or by a time-out interrupt on any of the intercomputer channels
	4. Data words are transferred sequentially, starting at a given address through a terminal address, on the specified input or output channel and at completion causes an internal monitor interrupt to the input, output, or external function monitor interrupt entrance register assigned to the input or output channel

Learning Objective: Recognize the logic circuits that are required to perform a specific function and identify the basic symbols that are used in making up the functional schematic for the CP-642B computer.

- 7-39. Refer to figure 4-33A in the textbook. In the illustrated inverter or driver, the logic or unique term is identified by (a), the type of card 7, 10J09 is identified by (b), and 13, 2070 the chassis and jack that the card is to be plugged into is specified by (c).
37F, 5J37F
- (a) 10J09 (b) 2070 (c) 5J37F
 - (a) 7 (b) 13 (c) 37F
 - (a) 10J09 (b) 2070 (c) 37F
 - (a) 7 (b) 2070 (c) 5J37F
- 7-40. Refer to figure 4-33B in the textbook. The small circles on the AND circuit indicate a (a) input is required to high, low satisfy the logic condition and the small circle on the OR circuit indicates a (b) high, low output is required to satisfy the logic condition.
- (a) low (b) low
 - (a) low (b) high
 - (a) high (b) high
 - (a) high (b) low
- 7-41. Refer to figure 4-33C in the textbook. In the illustrated flip-flop giving logic term 0XJ13, the (a) is replaced X, J with a (b) to specify the 0, 1 set side, or a (c) for the 0, 1 clear side.
- (a) J (b) 1 (c) 0
 - (a) J (b) 0 (c) 1
 - (a) X (b) 1 (c) 0
 - (a) X (b) 0 (c) 1

- 7-42. Refer to figure 4-33D in the textbook. Assume a normal I/O chassis card location in chassis A2. What would be the (a) logic term, (b) card type notation, and (c) card location?
1. (a) 460g4 (b) 2078 (c) 2J2N
 2. (a) 46024 (b) 2070 (c) gJ2C
 3. (a) 460A24 (b) 2070 (c) 2J35D
 4. (a) 46024 (b) 2078 (c) 2J2C

- 7-43. Refer to figure 4-34 in the textbook. Concerning the inverter circuit, (a) which pin requires a low output to satisfy the logic condition, (b) where is the output test point of the circuit, and (c) to which jack on chassis 5 is the card plugged into?
1. (a) 7 (b) 15D4 (c) 37F
 2. (a) 6 (b) 14J6 (c) 5J
 3. (a) 7 (b) 14J6 (c) 37F
 4. (a) 6 (b) 15D4 (c) J03

Learning Objective: Recognize the parts locations of the movable plugs of the CP-642B computer and determine the output test points.

Item 7-44 is to be judged True or False.

- 7-44. The main power supply for the computer provides the d.c. voltages used by the computer logic circuits, memory circuits, and the indicators, switches, and relays on the operator's console.

- 7-45. Refer to figures 4-34 and 4-37 in the textbook. The test point 14J6 of logic element 11J03 is located on test block (a), coordinates (b).
- 11, 14
- J6, 34E
1. (a) 11 (b) 34E
 2. (a) 14 (b) J6
 3. (a) 11 (b) J6
 4. (a) 14 (b) 34E

- 7-46. Refer to figure 4-38 in the textbook. Each computer chassis is divided into (a) 7 card rows (A through G), (b) 12 card rows (A through L) and (c) 62, 80 card columns.
1. (a) 7 card rows (A through G) (b) 80
 2. (a) 12 card rows (A through L) (b) 62
 3. (a) 7 card rows (A through G) (b) 62
 4. (a) 12 card rows (A through L) (b) 80

Learning Objective: Identify the procedures for manually writing into and reading from memory using the front panel controls.

- 7-47. Which of the following steps is taken for manually writing a single word immediately after setting U = 14030 yyyyy?
1. Set AfEn in Active Seq indicators
 2. Press START-STEP
 3. Press OP STEP
 4. Set Q = word to be stored

- 7-48. Which of the following steps is taken for manually writing consecutive words immediately before setting DISCONNECT B7 up?
1. Press OP STEP
 2. Set AfEn
 3. Set U = 70100 00003
 4. Press START-STEP

7-49. Which of the following steps is taken for manually reading a single word immediately after master clearing the front panel?

1. Press OP STEP
2. Set U = 10030 YYYY
3. Set AfEn
4. Press START-STEP

7-50. Which of the following steps is taken for manually reading consecutive words immediately before setting U = 10030 YYYY?

1. Press OP STEP
2. Set AfEn
3. Set DISCONNECT B7 up
4. Press START-STEP

Learning Objective: Specify the various manual tests used to isolate malfunctions and hold checks in the CP-642B computer.

For items 7-51 through 7-53, match the functions performed by the various manual tests given in column B with the type of manual tests listed in column A. All responses in column B are not necessarily used.

<u>A. TEST</u>	<u>B. FUNCTION</u>
7-51. 55 test	1. Uses the 55 test to check memory under marginal conditions
7-52. Memory capacity test	2. Continually reads the same address so that the waveforms can be checked to isolate the malfunctioning circuits
7-53. Magnetic core cycling test	3. Checks core memory by causing the quantity at each address to be the address itself
	4. Exercises the computer's ability to write any desired pattern of ones and zeros into all core memory without using a memory address to store the test

For items 7-54 and 7-55, match the functions performed by the various manual tests given in column B with the manual tests listed in column A. All responses in column B are not necessarily used.

<u>A. TEST</u>	<u>B. FUNCTION</u>
7-54. Repetition rate test	1. Permits the checking of a particular word and its associated circuitry
7-55. Cycle time test	2. Uses a repeated enter Q instruction which has a cycle time of four μ s (250,000 memory references per second)
	3. Measures the time between the leading and trailing edges of a signal to ensure that the cycle time is less than 700 ns at 50 per cent amplitude

Learning Objective: Identify the online peripheral equipment associated with the NTDS computer system while referencing a block diagram. Specify the basic functions of the peripheral equipment.

- 7-56. Which of the following is NOT an online NTDS peripheral equipment?
1. Teletypewriter
 2. Electronic accounting machine
 3. Magnetic tape unit
 4. System monitoring panel
- 7-57. Which of the following actions concerning computer programs are specialized NTDS peripheral units of equipment capable of performing?
1. Loading
 2. Storing
 3. Directly controlling
 4. All of the above

Item 7-58 is to be judged True or False.

- 7-58. The keyset central multiplexer (KCMX) is an interface that selects a keyset and passes the information to the NTDS computer.

Learning Objective: Specify the basic principles of magnetic storage, including tape drive, disk files, drum units, and core memories.

- 7-59. Which of the following actions will produce an electrical current?

1. Locating a conductor in a magnetic field
2. Rotating a conductor in a magnetic field
3. Varying the physical distance between a conductor and a source of magnetic flux
4. Both 2 and 3 above

- 7-60. Which of the following types of magnetic storage devices does NOT depend upon a change in the physical distance between a conductor (for example, a read/write head) and a source of magnetic flux, such as magnetic oxide surfaces?

1. Disk files
2. Drum units
3. Core memories
4. Tape drives

- 7-61. For core memories, the (a) destructive, nondestructive technique requires a (b) read, write operation to follow a (c) read, write operation to replace the contents.

1. (a) Nondestructive
(b) Write
(c) Read
2. (a) Destructive
(b) Write
(c) Read
3. (a) Nondestructive
(b) Read
(c) Write
4. (a) Destructive
(b) Read
(c) Write

Item 7-62 is to be judged True or False.

- 7-62. In three of the four magnetic storage devices, data is recorded as magnetized spots on the surface and a change in the flux patterns between adjacent spots on the surface is detected by the read/write head as a very small current.

- 7-63. What undesirable condition occurs when the write or erase currents are too weak in the magnetic recording of digital information?

1. Some of the prerecorded domains on the surface retain their polarity
2. The audio is completely suppressed
3. Cross talk is produced
4. The flux field will overlap adjacent fields or surface areas

- 7-64. An undesirable condition which occurs in nondestructive read-out when the write current is too strong is that a (a) diminished, expanded flux field is produced and a condition known as (b) cross, bias talk results.

1. (a) Expanded (b) bias
2. (a) Diminished (b) bias
3. (a) Expanded (b) cross
4. (a) Diminished (b) cross

- 7-65. Compared to the return to zero (RZ) system, the nonreturn to zero (NRZ) recording technique allows for

1. lower bit densities on the recording surface
2. higher bit densities on the recording surface
3. slower rise time
4. faster rise time

7-66. The return to zero technique detects the direction of flux change between adjacent spots as (a), and the 1, 0, either 1 or 0 nonreturn to zero technique detects the fact that there was a change, as (b).
1, 0

1. (a) 1 (b) 0
2. (a) either 1 or 0 (b) 1
3. (a) 0 (b) 1
4. (a) either 1 or 0 (b) 0

For items 7-67 through 7-70, match the action performed by parity given in Column B with the type of parity listed in Column A. Responses in Column B are only used once.

	<u>A. TYPE</u>	<u>B. ACTION</u>
7-67.	Odd parity	1. The parity bit(s) that follows a complete block of data
7-68.	Even parity	
7-69.	Lateral parity	2. All data bits are summed and found even, but by setting the parity bit, the total (including the parity bit) becomes odd
7-70	Longitudinal parity	3. Converts odd count sums to even
		4. The parity bit within each frame in tape drives

7-71. The redundant mode is a (a) hardware, software function and is so named because every bit is written or read (b) an infinite number of times, twice, either bit-by-bit, octal-by-octal, frame-by-frame, or word-by-word.

1. (a) hardware (b) twice
2. (a) hardware (b) an infinite number of times
3. (a) software (b) twice
4. (a) software (b) an infinite number of times

7-72. Comparison terms, such as fast, medium, or slow, pertaining to the capabilities and limitations of a particular peripheral device are primarily based on which of the following considerations?

1. How the device compares to the computer itself
2. How the device compares to other equipment of similar design
3. How the device compares to other types of peripheral equipment within a system configuration
4. All of the above

7-73. Which of the following actions occur(s) when the computer's data transfer rate drops below the minimum level that the magnetic storage device is able to maintain?

1. A missed frame error will occur during a read operation
2. A loss data error will occur on read operations
3. A missed frame error will occur during a write operation
4. Both 2 and 3 above

7-74. All flux patterns are converted by _____ (a) _____ erase operations
a.c., d.c.

to the _____ (b) _____ polarity
opposite, same

for the length and width of the surface where they are applied, and _____ (c) _____ erase operations
a.c., d.c.

scramble the domains on the surface so much that no discernible magnetic pattern remains.

1. (a) a.c.
(b) opposite
(c) d.c.
2. (a) d.c.
(b) same
(c) a.c.
3. (a) a.c.
(b) same
(c) d.c.
4. (a) d.c.
(b) opposite
(c) a.c.

Assignment 8

NTDS Peripheral Equipment

Textbook Assignment: DS 3&2, Vol 1, NAVEDTRA 10201-B1, pages 145 through 163

Learning Objective: Identify the types of magnetic storage used and magnetic tape responsibilities of the DS.

Items 8-1 through 8-3 are to be judged True or False.

- 8-1. The surface of most magnetic storage devices is usually an oxide of a metal alloy having desirable magnetic characteristics.
- 8-2. A tape drive offers better protection to its surface than a disk file or a drum unit.
- 8-3. Two main advantages of Mylar tape are that it is not affected by temperature extremes and it will not stretch.
- 8-4. What is the proper storage method for a magnetic tape?
1. On its side without a container
 2. On its side in a container
 3. On its end in a container
 4. On its end without a container
- 8-5. Arrange the steps below in the proper sequence for cleaning magnetic tape.
- A. The tape is wiped on both sides to remove any oxide or contaminants.
 - B. The tape is shaved by a series of razor edges to remove loose oxide and embedded particles.
 - C. The tape is wiped down on both sides with a cleaning solution.
1. A, B, C
 2. C, A, B
 3. B, A, C
 4. B, C, A
- 8-6. Which of the following procedures is/are normally recommended for a damaged magnetic tape of less than 600 feet in length?
1. The damaged portion is discarded
 2. The undamaged portions of the tape are spliced
 3. Both 1 and 2 above
 4. The tape is discarded
- Item 8-7 is to be judged True or False.
- 8-7. Concerning magnetic tape maintenance, a DS technician is primarily involved with the procedural techniques for proper splicing.
- 8-8. Which of the following factors might contribute to magnetic tape cling?
1. The shelf life of the tape
 2. Adherence due to temperature and humidity
 3. Built-up static charges
 4. All of the above
- 8-9. Which of the following procedures is NOT recommended for eliminating static cling from a recorded magnetic tape?
1. Degaussing
 2. Use of magnetic tape cleaner
 3. Move the tape from one reel to another reel and then back again
 4. Transfer the tapes to a suitable environment

- 8-10. To degauss a magnetic tape, a machine applies a varying strength
 (a) induced magnetic field
 a.c., d.c.
 to the tape which results in the
 (b)
 nondestruction, total destruction
 of any stored data on the tape
 and the complete nullification
 of all magnetic flux patterns.
1. (a) a.c. (b) total destruction
 2. (a) d.c. (b) total destruction
 3. (a) a.c. (b) nondestruction
 4. (a) d.c. (b) nondestruction

- 8-11. Which of the following functions is/are performed by the tape certifier?
1. Shaving and cleaning the magnetic tape prior to testing it
 2. Checking background noise levels of the tape
 3. Checking bit parallelism (skew) across the tape
 4. All of the above

- 8-12. Which of the following factors is/are checked during magnetic tape certification?
1. The tape's retention of flux patterns
 2. The tape's demagnetization
 3. The tape's capability of recording high bit densities
 4. All of the above

Item 8-13 is to be judged True or False.

- 8-13. An advantage of the tape certifier is that it requires a minimum of maintenance effort to keep it functioning at optimum levels.

- 8-14. Which of the following services are NOT provided by or for the tape transport concerning its maintenance in regard to wear, deterioration, and component value changes?
1. Computer readouts which isolate the transport problem area
 2. Special tests performed on the transport
 3. Precise standards set for the transport
 4. Electrical and mechanical adjustments made to the transport

Items 8-15 and 8-16 are to be judged True or False.

- 8-15. Because of the high degree of accuracy required for tape transport mechanical adjustments, a "mechanics tape" is discarded after its initial run to preclude the possibility of reusing a damaged or poor quality tape for subsequent adjustments.

- 8-16. A "skew" tape is one of exceptional quality which has been prerecorded under exacting laboratory conditions with all "1's" data and which provides a universal standard for tape transport adjustments.

- 8-17. Which of the following tapes is/are necessary to accurately set write levels in addition to providing a "1's" tape?

1. A "mechanic's" tape
2. A "skew" tape
3. Both 1 and 2 above
4. A "levels" tape

- 8-18. Which of the following conditions pertain to the various adjustments and tapes in reference to compatibility?

1. Lateral exchange must be achieved between tape transports
2. A currently written tape must be readable in the future
3. Previously written tapes must still be readable
4. All of the above

- 8-19. Which of the following achievements is/are pertinent to lateral exchange?

1. Compatibility between all tape transports within a computer system
2. Compatibility of tape transports between computer systems
3. Compatibility with a single tape transport's own read and write circuits
4. All of the above

For items 8-20 through 8-23, match the type of tapes or test most suitable or recommended (given in Column B) to achieve the desired tape transport compatibility (listed in Column A). Responses in Column B are only used once.

A. COMPATIBILITY B. TEST/TAPE

- | | | |
|-------|--|---|
| 8-20. | Used to establish compatibility between the read and write circuits of each transport separately | 1. A compatibility test that reads blocks of test data from a tape, then adds blocks of test data to be also read by it and by the next transport |
| 8-21. | Used to ensure that the tape transport is compatible with the other transports in the system by exchanging tapes | 2. The standard provided by the skew tape |
| 8-22. | Used to ensure that the transport is still compatible with prior tapes written by other transports | 3. Standardized test data tapes and compatibility programs |
| 8-23. | Used to ensure that the transports in one system are compatible with those of another system | 4. Old "1's" tapes or old compatibility tapes |

-
- 8-24. For which of the following reasons is it important that computer personnel establish and maintain tape logs?
1. They provide a history of the system for later reference
 2. They make use of previously noted facts and observations of other experienced personnel
 3. They assist other involved personnel in acquiring the capability for assembling and correlating facts
 4. All of the above

Item 8-25 is to be judged True or False.

- 8-25. In establishing intersystem compatibility, a ship should use its best tape transport in writing a copy and also use the same transport in generating an accompanying "1's" tape.
- 8-26. A tape transport consisting of an erase head and a dual purpose read/write head responds to flux variations during a _____ (a) _____ read, write operation, and generates new flux patterns during _____ (b) _____ an erase, a read, _____ operation.
a write
1. (a) read (b) an erase
 2. (a) write (b) a read
 3. (a) read (b) a write
 4. (a) write (b) an erase
- 8-27. The area on a tape required to produce one bit of information per track is commonly called a
1. square
 2. frame
 3. box
 4. bit count
- 8-28. A group of frames (consisting of either ones or zeroes) on a tape which is separated from other groups of frames by unrecorded sections of tape is referred to as a
1. data void
 2. block
 3. format
 4. reference point

8-37. If a byte of data has a unique numerical value, it may also be referred to as a

1. constant byte
2. numerical byte
3. binary-coded octal
4. code

8-38. In order to represent the following sequence (a) how many unique bytes of data would be required and (b) if the letter A is assigned a value of 0_2 , what would the binary value of the = symbol be?

$\begin{matrix} 26 & 10 \\ \{ \text{letters} \} & \{ \text{numerals} \} \\ \text{ABC...XYZ} & 012...789+-x\dot{;}.,:()"&?&= \end{matrix}$

(Note: The space is recognized as a special symbol.)

1. (a) Fifty (b) 110010
2. (a) Fifty (b) 110001
3. (a) Forty-nine (b) 110010
4. (a) Forty-nine (b) 110001

8-39. If a data field were five bytes long (figuratively speaking), how many data codes could it hold?

1. One
2. Two and one-half
3. Five
4. Ten

8-40. How many computer words may be involved with a single data field?

1. A part of one word
2. One word
3. More than one word
4. Each of the above

8-41. In troubleshooting tape equipment, the most frequently encountered problem probably would be

1. incompatibility
2. electrical skew
3. oxide deposits
4. bad tape

8-42. Which of the following would NOT cause loss of compatibility between tape transports?

1. Read/write levels
2. Electrical skew
3. Change in stop-start time
4. Bad tape

8-43. What is/are the MOST frequent type(s) of problem(s) in magnetic tape equipment?

1. Cleanliness
2. Adjustments
3. Both 1 and 2 above
4. Logic problems

Learning Objective: Learn the key features of the RD-243 magnetic tape unit, its application in NTDS, and how to mount a tape on a transport.

8-44. What is the primary purpose of the magnetic tape unit in NTDS?

1. Program control
2. Program loading
3. Online operation
4. Offline operation

8-45. What secondary function can the RD-243 provide in NTDS?

1. Program parameters
2. Intercomputer interface
3. Operational history
4. Extracted data retention

8-46. Which of the following hub types is used on RD-243 transports?

1. IBM
2. NTDS
3. UNIVAC
4. Standard

8-47. There are (a) tracks in each frame, of which (b) are used for data.

1. (a) Eight (b) seven
2. (a) Eight (b) six
3. (a) Seven (b) seven
4. (a) Seven (b) six

8-48. What logic function provides dual computer access to the RD-243?

1. Interface
2. Duplex control
3. Time sharing
4. Dual function control

8-49. The RD-243 can (A)
 read only, read
 at a tape speed of
or write
 (b)
 112.5 ips only, either 112.5 ips
 when tape is moving
or 225 ips
in reverse.

1. (a) Read or write
(b) Either 112.5 ips or 225 ips
2. (a) Read or write
(b) 112.5 ips only
3. (a) Read only
(b) Either 112.5 ips or 225 ips
4. (a) Read only
(b) 112.5 ips only

8-50. The OPERATION mode switch is mounted on which panel of the following panels?

1. The remote transport control
2. The local transport control
3. The magnetic tape control
4. The tape transport control

8-51. In the (a) position,
 normal, reversed
the TRANSPORT ADDRESS Switch
would cause transport #2 to be
on the (b) .
 top, bottom

1. (a) Normal (b) top
2. (a) Normal (b) bottom
3. (a) Reversed (b) top
4. Both 2 and 3 above

8-52. After setting the SPEED SELECT switch to the step position, which of the following pushbuttons will cause the clock to advance from 02 to 03?

1. The TIMING
2. The TEST/CLEAR
3. The CYCLE STEP
4. The PHASE STEP

8-53. Which of the following conditions will cause an "improper condition" status to occur?

1. Selecting neither or both transports
2. A rewind command at EOT
3. A reverse command at EOT
4. A forward command at BOT

8-54. Refer to figure 5-4 in the text: Which power switch(es) must be turned OFF for mounting or unmounting the upper transport?

1. The Magnetic Tape Unit 2 power switch only when the transport address is REVERSED
2. The Magnetic Tape Unit 1 power switch only when the transport address is set to NORMAL
3. The Magnetic Tape Unit 1 power switch under all conditions
4. Both 2 and 3 above

8-55. Which of the following push-buttons is used to put a tape transport in the manual (offline) mode by taking it out of the automatic (computer) mode?

1. STEP/CLEAR
2. MASTER CLEAR
3. MONITOR
4. AUTO

8-56. A master tape is identified by what means?

1. A label affixed to the take-up reel
2. An external function from the computer
3. A flat ring inserted into the supply reel rim
4. A pushbutton on the MTC panel

8-57. What does the MASTER TAPE indicator signify when lit?

1. This tape can only be read, not written on
2. This tape is only used as a program tape
3. This tape is used for read/write level adjustments
4. This tape is intended for skew adjustments

PHYSICAL ASSEMBLIES

- A. Tension arms
- B. Sensor arms
- C. Tape hubs
- D. Tape reels
- E. Pinch roller assemblies
- F. Vacuum chambers
- G. Capstans
- H. Limit switches
- I. Drag Pads

Figure 8-1

For items 8-58 through 8-62, select the physical assembly from figure 8-1 that provides the function described in the item.

8-58. Feeds out the tape.

- 1. C
- 2. D
- 3. E
- 4. G

8-59. Stores the tape.

- 1. A
- 2. C
- 3. D
- 4. F

8-60. Shuts the transport off if the tape breaks.

- 1. B
- 2. E
- 3. F
- 4. H

8-61. Changes tape direction.

- 1. A
- 2. C
- 3. E
- 4. G

8-62. Acts as a fine buffer system.

- 1. B
- 2. F
- 3. H
- 4. I

8-63. Which of the following is actually reported or used in the RD-243?

- 1. Low tape status
- 2. High tape status
- 3. Forward slowdown
- 4. Rewind slowdown

- A. Place an empty reel on the upper hub
- B. Place a reel of tape on the lower hub
- C. Pull the upper hub locking lever straight out
- D. Pull the lower hub locking lever straight out
- E. Lock the hub again with the locking lever
- F. Secure transport power
- G. Rotate the tape load handle clockwise
- H. Rotate the tape load handle counterclockwise
- I. Wrap the free tape end on the takeup reel clockwise several times to secure it
- J. Place the sensor arms back against their stops to clear the tape reels

Figure 8-2

For items 8-64 through 8-67, select the appropriate step(s) from figure 8-2 to complete each phase of a tape mounting operation described in the item.

8-64. The first three steps of mounting a tape should be

- 1. A, J, D
- 2. B, D, G
- 3. F, J, C
- 4. H, J, E

8-65. The three steps following step C would be

- 1. A, E, D
- 2. A, I, E
- 3. B, A, I
- 4. G, I, F

8-66. Which step requires extra care?

- 1. B
- 2. G
- 3. I
- 4. J

8-67. By what means is the tape secured to the takeup reel?

- 1. By multilayered friction
- 2. By hub slot insertion
- 3. By reel slot insertion
- 4. By magnetic attraction

8-68. How is tape placed into the tape groove?

1. The free end from the takeup reel is drawn along the groove path
2. The free end from the supply reel is drawn along the groove path
3. The slack from the takeup reel forms a loop that is laid into the groove path
4. The slack from the supply reel forms a loop that is laid into the tape load position

Assignment 9

NTDS Peripheral Equipment

Textbook Assignment: DS 3&2, Vol 1, NAVEDTRA 10201-B1, pages 163 through 176

Learning Objective: Once a tape is mounted on a transport, learn the proper way to thread the tape through the mechanism and remove it from the transport.

- 9-1. When properly loaded, the tape should be between the (a) sensor, (b) tension arm rollers and the stationary rollers of the (a) bridge, pinch roller assemblies.
1. (a) sensor (b) bridge
 2. (a) sensor (b) pinch
 3. (a) tension (b) bridge
 4. (a) tension (b) pinch
- 9-2. The tape must pass (a) below, above the BOT lamp and (b) under, over the EOT lamp.
1. (a) below (b) under
 2. (a) below (b) over
 3. (a) above (b) under
 4. (a) above (b) over
- 9-3. When the tape is properly loaded, where will the transparent leader be positioned?
1. On the outer layer of the supply reel
 2. Under the EOT lamp
 3. Under the BOT lamp
 4. On the takeup reel
- 9-4. When the power switch in Magnetic Tape Unit 1 is placed to ON, which of the following will occur?
1. The blower will be activated
 2. The pinch rollers will become engaged
 3. The hubs will rotate in a forward direction until EOT is reached
 4. The tension arms will not move
- 9-5. The FWD indicator button on Magnetic Tape Unit 1 will cause which of the following to occur?
1. The FWD pinch roller to deenergize
 2. The FWD pinch roller to energize
 3. The tape to become properly seated in the tension arm grooves
 4. Both 2 and 3 above
- 9-6. Once power is applied to a tape transport, what three steps will assist in verifying that the tape is properly mounted?
1. Run the tape in reverse, then forward, then press the STOP-CLEAR button
 2. Run the tape forward, then in reverse, then push the STOP-CLEAR button
 3. Rewind the tape, then run it forward, then push the STOP-CLEAR button
 4. Run the tape forward, press the STOP-CLEAR button, then rewind the tape

9-7. Which indicator/pushbutton will permit automatic operation of the MTU by the computer?

1. MASTER CLEAR
2. AUTO
3. A IN CONTROL
4. SELECTED

9-8. When a tape is to be removed, what step will place it in manual control (and remove it from computer control) without affecting the other tape transport which may be in use?

1. Pressing STOP-CLEAR
2. Reversing Transport Address
3. MASTER CLEAR
4. Pressing T20 in End of Function sequence

9-9. The purpose of rotating each reel independently after the tension arms are drawn in is to

1. release tension in the tension arms
2. feed tape from one reel to the other
3. take up tape slack
4. allow slack for removing the tape from the vacuum chambers

Learning Objective: To identify programming considerations required in the use of the RD-243; to recognize the RD-243 tape format. This objective continued in Assignment 10.

9-10. Computer programs control the RD-243 by using which of the following?

1. Status words
2. External function words
3. Data words
4. All of the above

The computer sends an external function word requesting release, local, master clear, and rewind with lockout bits set.

9-11. Which of the following designated functions would have the highest priority?

1. Duplex
2. Master clear
3. Request control
4. Release control

9-12. What is the octal coding of the external function word?

1. 00000 00114₈
2. 00000 00112₈
3. 00000 00214₈
4. 00000 00212₈

9-13. Which of the following instructions can be executed simultaneously?

1. Request control and release local
2. Request control and release remote
3. Release local and release remote
4. Request control, release local, and release remote

9-14. The RD-243 will generate an interrupt to the computer after which of the following?

1. Release remote
2. Release local
3. Request control
4. All of the above

9-15. Refer to figure 5-9 in the text. The RD-243 status interrupt word is used to inform the computer when which of the following conditions exists?

1. The computer has control
2. The last function was completed normally
3. The last function was completed abnormally
4. Each of the above

Figure 9-1

Refer to figure 9-1 above and figure 5-8 in the text when answering questions 9-11 through 9-13.

- 9-16. Refer to figure 5-8 in the text. Which of the following bits would NOT be pertinent to a write operation?
1. Reverse direction
 2. Parity format
 3. Low density
 4. Tape Transport 1
- 9-17. Which, if any, of the following statements about the RD-243 I/O functions is INCORRECT?
1. The input or output buffer precedes the status interrupt word
 2. The external function word precedes the status interrupt word
 3. The external function word precedes the input or output buffer
 4. None of the above
- 9-18. What type of errors can be avoided by maintaining the proper sequence when initiating read/write operations?
1. Sync errors
 2. Input timing errors
 3. Output timing errors
 4. Both 2 and 3 above
- 9-19. By which of the following does the magnetic film developer leave an imprint on the tape?
1. Oxide adhesion
 2. Evaporation deposits
 3. Magnetic attraction
 4. Both 2 and 3 above
- 9-20. By what means would a permanent copy of the developed film normally be made?
1. Applying a "fix"
 2. Photography
 3. Tape transference
 4. Oxide bonding
- 9-21. The RD-243 uses a $\frac{(a)}{\text{gummed, spliced}}$, $\frac{(b)}{\text{reflective, transparent}}$ tape for its BOT and EOT.
1. (a) Spliced (b) transparent
 2. (a) Spliced (b) reflective
 3. (a) Gummed (b) transparent
 4. (a) Gummed (b) reflective
- 9-22. Which of the following statements is true?
1. The RD-243 uses double file marks to mark the end of the data field
 2. Records are generally made up of one or more blocks
 3. Blocks are generally made up of one or more records
 4. Blocks and records are synonymous
- 9-23. What determines the practical upper limit to the number of CP-642B computer words that can be written into one block on magnetic tape, using Redundant format?
1. Number of available sprockets
 2. Tape length
 3. RD-243 bit density format
 4. CP-642B memory size
- Items 9-24 and 9-25 are to be judged True or False.
- 9-24. The RD-243 uses odd parity for both Parity and Redundant formats.
- 9-25. NTDS and UNIVAC are synonymous with Redundant.
- 9-26. The limit of 24 words per block is established by
1. tape width
 2. intersystem convention
 3. use of the NTDS format
 4. maximum buffer length
- 9-27. Which of the following formulas would yield the number of inches required for storing 210 30-bit computer words in high-density parity format?
1. $210 \times \frac{210 \times 8}{5}$
 2. $210 / \frac{210 \times 8}{5}$
 3. $210 \times \frac{210}{5 \times 8}$
 4. $210 / \frac{210}{5 \times 8}$

- | |
|---|
| A. Duplexer
B. Tape Transport Control
C. Magnetic Tape Control
D. Tape Transport |
|---|

Figure 9-2

For item 9-28, refer to figure 9-2.

9-28. What is the order of sections involved from the point where the computer issues an external function word to the RD-243 to the point where the tape actually moves?

1. ABCD
2. ACBD
3. ACDB
4. CABD

For items 9-29 through 9-33, match one of the four major MTU sections from Column B with a function it performs in Column A. The MTU sections in Column B may be used more than once.

<u>A. FUNCTION</u>	<u>B. MAJOR MTU SECTION</u>
9-29. Eliminates manual switching of the RD-243 from computer to computer.	1. Duplexer
9-30. Distributes data between the computer and the selected tape transport	2. Tape Transport Control (TTC)
9-31. Checks for improper condition	3. Magnetic Tape Control (MTC)
9-32. Provides for tape movement and read/write capabilities.	4. Tape Transport
9-33. Controls the tape transport.	

9-34. Which duplex function(s) permit(s) one computer to interfere with another computer's use of the RD-243?

1. The release local function
2. The release remote function
3. The request control function
4. Both 2 and 3 above

9-35. Which section actually converts the computer words into bytes, or bytes into computer words?

1. The duplexer
2. The tape transport control
3. The magnetic tape control
4. The tape transport

9-36. The start of Function, Read/Write Shift, and End of Function are used by which section of the RD-243 to control its operation?

1. Duplexer
2. Magnetic Tape Control
3. Tape Transport Control
4. Tape transport

For items 9-37 through 9-40, select the logic section in Column B that performs the function listed in Column A. The logic section in Column B may be used more than once and all sections may not necessarily be used.

<u>A. FUNCTION</u>	<u>B. LOGIC SECTION</u>
9-37. Requests data from the computer.	1. Start of Function Sequence
9-38. Decodes external functions from the computer.	2. End of Function Sequence
9-39. Exits to the End of Function sequence.	3. Read/Write Shift Sequence
9-40. Initiates the Read/Write Shift sequence.	4. Function Register

9-41. How many groups would a 30-bit word written in (a) NTDS format and in (b) UNIVAC format require?

1. (a) 20 (b) 10
2. (a) 10 (b) 5
3. (a) 5 (b) 10
4. (a) 10 (b) 20

9-42. If the Read/Write Shift sequence has assembled a second word completely before the first work has been transmitted to the computer, what indication of this will appear in the following status interrupt word?

1. The Improper Condition bit will be set
2. The Sync Error bit will be set
3. The Output Timing Error bit will be set
4. The Input Timing Error bit will be set

9-43. A computer input terminates, and the computer receives an external interrupt from the MTU indicating an ITE has occurred. What does this signify?

1. That one or more words intended for the computer may have been lost
2. That the computer's input buffer may have been too large
3. Both 1 and 2 above
3. That the received data is totally in error

9-44. Under which, if any, of the following conditions would an OTE condition (i.e., a late or nongenerated output acknowledge signal from the computer) be INHIBITED from appearing in the status word after the output buffer terminates?

1. After the first word has been written on tape, and before the EOF sequence is initiated
2. When the MTU is prepared to write the first frame of tape
3. Once the EOF sequence has been initiated
4. None of the above

9-45. Of the following, which error condition, if any, will exist if the MTU ceases to detect data on the tape?

1. An input timing error
2. An output timing error
3. An improper condition
4. None of the above

9-46. Which of the following error conditions would be transmitted to the computer if the final assembled word were incomplete?

1. An improper condition
2. An OUT OF SYNC error
3. An output timing error
4. An input timing error

9-47. The (a) of Function sequence Start, End initiates a delay for the (b) first, second half of the IBG and resets the MTC for the next external function code.

1. (a) End (b) second
2. (a) Start (b) second
3. (a) End (b) first
4. (a) Start (b) first

For items 9-48 through 9-51, match the register in Column B with the function in Column A. Responses in Column B are used only once.

<u>A. FUNCTION</u>	<u>B. REGISTER</u>
9-48. Data nonduplex external functions and status words all pass through this register	1. F 2. C 3. Z 4. S
9-49. Retains the current external function code	
9-50. Accumulates error indications	
9-51. Uses 30 bits in the assembly and disassembly of words	

- 9-52. Which of the following will NOT be transmitted to the C register?
1. Data
 2. Nonduplex functions
 3. Status words
 4. Duplex control codes
- 9-53. The status register receives its status indications from which of the following?
1. The magnetic tape control circuits only
 2. The duplexer logic circuits only
 3. Various circuits in the magnetic tape unit
 4. The tape transport control circuits only
- 9-54. The status register will indicate errors that occurred during which of the following operations?
1. Read
 2. Write
 3. Previous write
 4. All of the above
- 9-55. What register uses 6 bits in the assembly or disassembly of words?
1. The C register
 2. The F register
 3. The S register
 4. The X register
- 9-56. What does the error counter count?
1. All input timing errors
 2. All output timing errors
 3. All parity errors
 4. All of the above
- 9-57. What output(s) does the error counter provide?
1. It provides visual indications of the difficulty
 2. It generates both parity and error status
 3. It sets interrupt bits to show the number of errors
 4. All of the above
- 9-58. The parity translator provides (a) parity when writing, and odd, even verifies (b) parity when reading. odd, even
1. (a) odd (b) odd
 2. (a) odd (b) even
 3. (a) even (b) odd
 4. (a) even (b) even
- 9-59. In the NTDS (Redundant) mode, the parity bit is always a (a) and 1, 0 as such, has the same phasing as the (b) interblock gap, sprocket track bit, making it effectively a redundant sprocket bit.
1. (a) 1 (b) interblock gap
 2. (a) 1 (b) sprocket track bit
 3. (a) 0 (b) interblock gap
 4. (a) 0 (b) sprocket track bit
- 9-60. The determination as to whether the tape transport can perform the requested function is made in the
1. duplexer section
 2. magnetic tape control section
 3. tape transport control section
 4. tape transport section
- 9-61. Which of the following make up the primary drive mechanics?
1. Pinch rollers and hub servomechanisms
 2. Capstans and hub servomechanisms
 3. Pinch rollers and capstans
 4. Hub servomechanisms, pinch rollers, and capstans
- 9-62. The sensing elements required for checking such things as BOT, EOT, tape breakage, write lockout, etc., are located in the
1. duplexer section
 2. magnetic tape control section
 3. tape transport control section
 4. tape transport section
- 9-63. What would be the consequence of power loss to the capstan motor?
1. The transport would immediately cause an emergency power off condition
 2. Only one capstan would be affected, permitting tape motion to still occur in the opposite direction
 3. Both capstans would be affected, inhibiting any tape motion in either direction
 4. The photoelectric sensors would detect constant BOT and EOT status indications

9-64. If a pinch roller assembly would not activate, what would be the consequence?

1. The transport would immediately cause an emergency power off condition
2. Only tape motion in one direction would be affected
3. Tape motion could not occur in either direction
4. The transport would suffer a tape spill

9-65. What areas of the transport are used for some form of tape storage?

1. Tape reels
2. Tension arms
3. Vacuum chambers
4. All of the above

Item 9-66 is to be judged True or False.

9-66. The inward and outward deflection of the tension arms is caused by the amount of tape on the tension arms.

9-67. Which of the following would cause a tension arm to move away from its midrange position?

1. Tape being added to it by the primary drive mechanics only
2. Tape being removed from it by the primary drive mechanics only
3. Both 1 and 2 above
4. Tape either being added to or removed from it by the movement of the tape reels

9-68. Movement of the tension arms is detected by a potentiometer which generates an error signal. Which of the following determine(s) the polarity of the error signal?

1. An increase in the amount of tape on the tension arms
2. A decrease in the amount of tape on the tension arms
3. Both 1 and 2 above
4. The upward direction of the offset

9-69. Outward movement of the upper tension arm takes place when

(a) tape is added to, tape is removed it, while the lower tension arm simultaneously moves (b) outward, from its midrange position. inward

1. (a) tape is added to
(b) outward
2. (a) tape is added to
(b) inward
3. (a) tape is removed from
(b) outward
4. (a) tape is removed from
(b) inward

9-70. The direction the tension arms have moved with respect to (a) each

other, their midrange positions determines the direction of rotation for their servo motors, while each increase in their offset will result in a corresponding (b) increase, decrease in the hub servo motor speed.

1. (a) each other
(b) increase
2. (a) each other
(b) decrease
3. (a) their midrange positions
(b) increase
4. (a) their midrange positions
(b) decrease

9-71. Which, if any, of the following will cause the tension arm to become stabilized in its arc of movement?

1. The tape reel speed is slower than the tape tension arm speed
2. The tape reel speed is faster than the tape tension arm speed
3. The tape reel speed is equal to the tape tension arm speed
4. None of the above

9-72. What would be the most probable result of an irregular operation of the tape transport?

1. Tape would fly out from the tension arms
2. Power would immediately shut off before any effects would occur
3. Tape would wrap itself around either capstan
4. Tape would break

9-73. Dashpots are used to absorb excessive energy in the _____ (a) _____ tension arms, hub servo motors that might otherwise cause damage to the tension arms if the _____ (b) _____ tape breaks,

hub brakes fail.

1. (a) tension arms
(b) tape breaks
2. (a) tension arms
(b) hub brakes fail
3. (a) hub servo motors
(b) tape breaks
4. (a) hub servo motors
(b) hub brakes fail

9-74. The initial data reference point is obtained from the _____ (a) _____ BOT, EOT label, which is detected via a/an _____ (b) _____ electromechanical, photoelectric sensor.

1. (a) BOT
(b) electromechanical
2. (a) BOT
(b) photoelectric
3. (a) EOT
(b) electromechanical
4. (a) EOT
(b) photoelectric

Item 9-75 is to be judged True or False.

9-75. When tape movement stops at either label, the tape section across the head will be oxide coated and positioned between the two labels.

Assignment 10

NTDS Peripheral Equipment

Textbook Assignment: DS 3&2, Vol 1, NAVEDTRA 10201-B1, pages 176 through 189

Learning Objective-continued: To identify programming considerations required in the use of the RD-243; to recognize the RD-243 tape format.

Refer to figure 5-6 in the text when answering item 10-1.

10-1. When moving forward, the EOT label will stop (a) reaching the read/write head, and when moving in reverse, the BOT label will stop (b) reaching the read/write head.

1. (a) before (b) before
2. (a) before (b) after
3. (a) after (b) before
4. (a) after (b) after

10-2. Which of the following is/are the purpose(s) of the vacuum buffer?

1. To isolate tape on the tension arm from the tape drive system
2. To smooth out small, jerky movements of the tape
3. To prevent tape slippage and positioning errors
4. All of the above

10-3. A FWD command activates the upper pinch roller assembly. How will this affect the (a) upper vacuum chamber, and (b) upper tension arm?

1. (a) Increases vacuum (b) adds more tape
2. (a) Increases vacuum (b) removes some tape
3. (a) Decreases vacuum (b) adds more tape
4. (a) Decreases vacuum (b) removes some tape

Items 10-4 through 10-8 are to be judged True or False.

10-4. The sensor arms on the RD-243 are used to slow high speed movement in either direction.

10-5. The dashpots prevent the sensor arms from striking their stops with great force.

10-6. A single capstan motor powers both capstans

10-7. Tape moves as soon as the capstans are energized

10-8. High tape speed in the RD-243 is 225 ips.

- 10-9. The (a) pinch roller
upper, lower
is used for the forward direction
when the pinch roller solenoid
is (b)
energized, deenergized
1. (a) upper (b) energized
 2. (a) upper (b) deenergized
 3. (a) lower (b) energized
 4. (a) lower (b) deenergized

- 10-10. What purpose does the speed
change relay have in the RD-243?
1. It changes tape speed for
forward and reverse tape
motion
 2. It senses changes in direc-
tion and speed when they
occur
 3. It adjusts for changes in
bit density selection
 4. It affects the rotating
speeds of the capstans

- 10-11. If the tape breaks and power is
suddenly removed from the hub
motors, which of the following
will occur?
1. An electric brake will stop
the reel motors
 2. A spring-loaded brake will
stop the reel motors
 3. The reel motors will reverse
their direction
 4. The reel motors will not be
affected

- 10-12. A small scratch across the tracks
on the head seems to be the
reason one tape transport cannot
be adjusted to read or write
without errors. The proper
procedure to correct this prob-
lem would be to
1. polish the area with BRASSO
and a soft chamois cloth
 2. rub very gently with #150
or finer emery cloth
 3. use jeweler's rouge and an art
eraser, alternately, to
polish the head
 4. replace the head and return
the defective one for re-
pairs

- 10-13. Details on replacing the read/
write head can be found in the
1. EIMB, General Maintenance
Handbook
 2. maintenance section of the
technical manual
 3. troubleshooting section of
the technical manual
 4. EIBs

- 10-14. The tape transport mechanics
are controlled by six (a)
modules, sensing elements
located in the (b)
tape transport,
drive electronics unit
1. (a) modules
(b) tape transport
 2. (a) modules
(b) drive electronics unit
 3. (a) sensing elements
(b) tape transport
 4. (a) sensing elements
(b) drive electronics unit

For items 10-15 through 10-18, select
the function from Column B that is per-
formed by the module in Column A.
Functions in Column B are used only once.

	<u>A. MODULE</u>	<u>B. FUNCTION</u>
10-15.	Solenoid Drive Module	1. Provides reference voltage to be used for controlling the servo motors
10-16.	Speed Select Module	
10-17.	Servo Modulator Supply Module	2. Controls the direction and speed of each servo motor
10-18.	Servoamplifier Module	3. Generates zero offset in the servo- amplifier modules for the tension arms
		4. Chooses 112.5 or 225 ips

- 10-19. Which of the following modules is used to detect tape labels?
1. The solenoid drive
 2. The speed select
 3. The servoamplifier
 4. The EOT/BOT amplifier
- 10-20. Which module type appears twice in each drive electronics unit?
1. Speed select module
 2. EOT/BOT amplifier module
 3. Solenoid drive module
 4. Servoamplifier module
- 10-21. Manual operation of the RD-243 may NOT indicate proper operation of which of the following circuits?
1. Duplex
 2. Input
 3. Output
 4. All of the above
- 10-22. What type errors are best analyzed during computer operations rather than during manual operations?
1. Parity
 2. ITE
 3. OTE
 4. Timing
- 10-23. The C register will show data errors that occurred during which of the following operations?
1. Read
 2. Previous Write
 3. Both 1 and 2 above
 4. Write
- 10-24. In the RD-243, a manual operation that is intended to simulate a computer operation would be initiated with the function code inserted in the
1. F register
 2. C register
 3. Z register
 4. start function register
- 10-25. Which of the following statements, if any, best describes the basic objective in manually testing the RD-243?
1. To free the computer for more demanding work
 2. To test as many functions as possible
 3. To duplicate computer operations precisely
 4. None of the above
- 10-26. What should be done in order to initiate a reverse or rewind manual operation?
1. Press the REV button on the tape control
 2. Move the tape forward for several minutes
 3. Press the REW button on the tape transport
 4. Rewind the desired transport
- 10-27. For manual operations, which, if any, duplex control must be enabled?
1. A Out Control only
 2. A In Control only
 3. B In Control only
 4. Either A or B In Control, but not both
- 10-28. If the operator wanted to initiate a manual write operation for Tape Transport 1, at which point in the 11-step procedure would he set the necessary bits of the C register?
1. Step 1
 2. Step 7
 3. Step 8
 4. Step 9

A manual write operation has been initiated on one transport which was situated at BOT using the first method described in the text. Once tape motion has been initiated and the tape has moved a short distance, the CLR button for the C register is pressed, and each bit is then manually set in the register sequentially from 2^9 through 2^0 . When the final bit is set, the write operation is manually terminated and the transport is returned to BOT using the RWD button.

The following are conditions that can be seen in the C register during subsequent reads of the data block just written, though not necessarily in the order given nor together in the same read operation. During the write operation, the observed order is A, B, C, D, and B again.

<u>CONDITION</u>	
A.	The function word for a write operation
B.	No bits lit
C.	Sequential lighting of the bits from 2^{29} through 2^0
D.	All bits lit
E.	The function word for a read reverse operation
F.	Sequential extinguishing of the bits from 2^0 through 2^{29}

Figure 10-1

Refer to figure 10-1 when answering items 10-29 and 10-30.

- 10-29. During a FWD READ of the data block using method 2 in the text, what order of conditions would be observed in the C register during the period of tape motion?
1. The same as for the write operation
 2. The reverse order of the write operation, plus another B
 3. B, D, C, B, E, B
 4. E, B, C, D, B

- 10-30. During a REV READ of the same data block, what order of observable condition will be seen in the C register from before tape motion is initiated (using the first method described in the text), until after the point where tape motion ceases?
1. E, B, D, F, B, A
 2. E, B, C, D, B
 3. E,C,D,B
 4. A,B,C,D,B

- 10-31. Which, if any, of the following is normally seen in the C register at the end of a read or write operation?
1. The last external function code from the computer
 2. The last data word transmitted to or received from the computer
 3. The last status word sent to the computer
 4. None of the above

- 10-32. Which, if any, of the following conditions will NOT result in the termination of a manual write operation?
1. Setting the Operation Mode switch to INSPECT EF
 2. Reaching an IBG on the tape
 3. Reaching the EOT label on the tape
 4. None of the above

- 10-33. If the Operation Mode switch is NOT switched to the INSPECT EF position (the means by which the function can be manually inserted through the C register), how, if at all, would the function be manually inserted?
1. Directly into the function register (fig. 5-3)
 2. Via the computer interface (fig. 5-1)
 3. Through the tape transport control panel (fig. 5-4)
 4. None of the above

- 10-34. The timing flip/flop T2 can be manually pressed to initiate a portion of the (a),
Start and End,
function
End and Start
sequences, but the use of the T2 pushbutton requires that the function desired be already in the (b) register.
C, function
1. (a) End and Start
(b) Function
 2. (a) End and Start
(b) C
 3. (a) Start and End
(b) Function
 4. (a) Start and End
(b) C
- 10-35. Which of the following reasons makes method 1 of initiating a manual operation of the RD-243 preferred over method 2 in some instances?
1. More closely parallels the approach used when under computer control
 2. Easier to remember and enter the function desired
 3. Eliminates errors that result from slow switch movement
 4. Provides a simpler procedure
- 10-36. If step 12 is omitted, the procedure outlined under Write Operations in the text can be used for writing 1s data on all of the following EXCEPT
1. skew tapes
 2. mechanics tapes
 3. levels tapes
 4. 1's tapes
- 10-37. The Speed Select switch is useful during which of the following manual operations?
1. Write
 2. Rewind
 3. Read
 4. All of the above
- Items 10-38 through 10-40 are to be judged True or False.
- 10-38. Depressing and holding the Operational Mode key during a write operation, will result in an improper parity written on tape.
- 10-39. The information obtained while checking the error counter during a write operation can also be used to check the error counter during a subsequent read operation.
- 10-40. The Operational Mode switch controls the rate at which short blocks of data are written or read from the tape.
- 10-41. A technician performs repeated manual write operations by holding the write function bits set in the C register with one hand and manipulating the Operational Mode switch with the other. In what positions would the Operational Mode switch cause the bits of the C register to (a) form the manual function code, and (b) form the data for a write operation?
1. (a) Test T.D.
(b) Normal
 2. (a) I/O Inact
(b) Inspect EF
 3. (a) Inspect EF
(b) I/O Inact
 4. (a) Normal
(b) Test T.D.
- 10-42. A technician has written a series of data blocks using the repeated manual operation technique, and the Operational Mode switch was left in the position for writing data for approximately three seconds during each block. What would be (a) the fastest rate of recovery possible for this data during a repeated manual read operation, and (b) what would be the slowest rate of recovery possible under the same conditions?
1. (a) Any interval faster than three seconds
(b) Any interval slower than and including three seconds
 2. (a) Three seconds
(b) Any interval slower than three seconds
 3. (a) Three seconds
(b) Three seconds
 4. (a) Any interval faster than three seconds
(b) Three seconds

- 10-54. What happens if the read circuits on a magnetic tape unit are made too sensitive?
1. Low signal levels, when using tapes of poor quality, are likely to result in a loss of 1's data
 2. Sources of background noise on the tape may be detected as data
 3. Close placement of the read/write heads will cause write head data to be detected by the read head and result in degenerative feedback in the read/write circuits
 4. All of the above
- 10-55. Which of the following tests is intended for detecting potential problem areas?
1. Operational
 2. Trigger
 3. Marginal
 4. Bias
- 10-56. The (a) pads are used to brake, drag stop the tape, and are applied to the loaded tape (b) at all times, (a) sometimes.
1. (a) Drag (b) sometimes
 2. (a) Drag (b) at all times
 3. (a) Brake (b) sometimes
 4. (a) Brake (b) at all times
- 10-57. If tape runs off the takeup reel at the end of a rewind operation, what adjustment(s) is/are probably off?
1. EOT
 2. BOT
 3. Both 1 and 2 above
 4. Dashpot
- 10-58. The indications are that proper vacuum pressure is not being maintained in the vacuum chambers. Which of the following corrective operations should NOT be taken by the ship's force?
1. Replace the vacuum motor
 2. Reseat the vacuum chamber divider
 3. Adjust the vacuum ports
 4. Clean the chamber area
- 10-59. The head alignment involves (a) how many axes of rotation, and (b) how many measurements along each axis?
1. (a) Three (b) three
 2. (a) Three (b) two
 3. (a) Two (b) three
 4. (a) Two (b) two
- 10-60. Making a head alignment requires the use of (a) shims, tapered wedges and the adjustments along one axis will affect (b) only that, each axis.
1. (a) Tapered wedges (b) Each
 2. (a) Tapered wedges (b) Only that
 3. (a) Shims (b) Each
 4. (a) Shims (b) Only that
- 10-61. A tape which is correctly aligned to the read/write heads (a) will, will not be skewed, but the angle at which the (b) tape reels and hubs, (a) pinch rollers and capstans contacts the tape will affect the tapes skew.
1. (a) Will not (b) Pinch rollers and capstans
 2. (a) Will not (b) Tape reels and hubs
 3. (a) Will (b) Pinch rollers and capstans
 4. (a) Will (b) Tape reels and hubs
- 10-62. Improper operation of the primary drive mechanics (pinch rollers and capstans) results primarily from which of the following conditions?
1. Periodic use of maintenance programs
 2. Loose movement, unevenness, and evidence of a lack of physical alignment
 3. An evidence of wear
 4. Both 2 and 3 above

10-63. Return force is used primarily to perform which of the following functions?

1. Return the solenoid to its proper position
2. Return the pinch roller to the tape
3. Allow quick tape stops
4. All of the above

10-64. What adjustment(s) may be altered when setting pinch roller/capstan clearance?

1. Parallelism
2. Drive force
3. Return force
4. All of the above

10-65. Drive force is initiated by solenoid (a) activation, deactivation and is countered by the (b) return, breakaway force.

1. (a) activation
(b) return
2. (a) activation
(b) breakaway
3. (a) deactivation
(b) return
4. (a) deactivation
(b) breakaway

10-66. Which of the following measurements are synonymous?

1. Breakaway and drive
2. Parallelism and return
3. Breakaway and parallelism
4. Drive and return

Assignment 11

NTDS Peripheral Equipment

Textbook Assignment: DS 3&2, Vol 1, NAVEDTRA 10201-B1, pages 190 through 215

Learning Objective: Identify the forms of misalignment caused by electrical head skew and the steps used to establish a maintenance program from magnetic tape.

- 11-1. Which of the following tapes is normally used for checking electrical skew?
1. Mechanics
 2. Levels
 3. 1's
 4. Skew
- 11-2. Which of the following tapes must be used for adjusting the electrical skew of the RD-243?
1. Mechanics
 2. Levels
 3. 1's
 4. Skew
- 11-3. When deskewing RD-243 transports, the normal procedure is to use a 1's tape written on the _____ (a) _____ drive and to commence deskewing operations on the _____ (b) _____ transport.
1. (a) best (b) best
 2. (a) best (b) worst
 3. (a) worst (b) best
 4. (a) worst (b) worst
- 11-4. What would be the results if a compatibility standard did not exist in a system?
1. Old tapes could no longer be read
 2. Certain drives could only read specific tapes
 3. New tapes would often prove unreliable later
 4. All of the above
- 11-5. A problem in establishing compatibility between a transport's read and write circuits would result in what steps being taken until the situation is corrected?
1. Limiting the transport to read operations
 2. Limiting the transport to write operations
 3. Limiting the transport to erase operations
 4. Limiting the transport to offline operations
- 11-6. What feature of the RD-243 simplifies problems of compatibility considerably?
1. Its return to zero format
 2. Its use of a clock track
 3. Its low density
 4. Its biocetal recording technique

- 11-7. What is the MINIMUM number of 1's tapes that should be retained as system deskewing tapes for the RD-243?
1. One
 2. Two only
 3. Three
 4. Two, and two in reserve
- 11-8. What factor(s) would affect the frequency of tape transport cleaning?
1. Indication of errors
 2. Condition of tapes
 3. Frequency of usage
 4. All of the above
- 11-9. What program is used to load the first block of data on an NTDS program tape?
1. Bootstrap
 2. Call number 1
 3. Call number 0
 4. Utility
- 11-10. What program is used to load all subsequent programs from an NTDS program tape?
1. Bootstrap II
 2. Bootstrap I
 3. Call number 1
 4. Utility
- 11-11. If a program occupies the entirety of the computer's memory and contains no provisions for calling subsequent programs, what procedure must be followed for loading additional programs?
1. Institute a core dump
 2. Make utility calls
 3. Rebootstrap the computer
 4. Load the next program by hand
- Learning Objective: To learn the basic applications, operational characteristics of, and specific considerations in using the RD-231A paper tape unit in NTDS.*
- 11-12. Data transfers between the computer and the RD-231 paper tape occupy seven, thirty bits of a normal, special pair of I/O cables.
1. (a) Thirty (b) special
 2. (a) Thirty (b) normal
 3. (a) Seven (b) special
 4. (a) Seven (b) normal
- 11-13. Thirty-bit words are packed/unpacked (i.e., assembled/disassembled) by
1. the computer program
 2. paper tape punch logic
 3. paper tape reader logic
 4. PTU I/O control logic
- 11-14. Which tape level is normally used as the parity level on paper tape?
1. First
 2. Second
 3. Fourth
 4. Seventh
- 11-15. In figure 5-17 of the text, the receptacle on the left side of the machine is used for which of the following purposes?
1. To catch punch chad from the punch
 2. To catch tape from the punch
 3. To catch tape from the reader
 4. Both 2 and 3 above
- 11-16. The FAULT indicator on the PTU control panel is turned on by which of the following?
1. A signal from the computer
 2. A write error
 3. A reader error
 4. A punch error

- 11-17. What indication is there that a "punched" tape contains data if only zeros have been recorded in the data levels and odd parity is used?
1. The presence of a feed hold in each frame
 2. The presence of a utility bit in each frame
 3. Both 1 and 2 above
 4. The leader portion contains all "1's"
- 11-18. If the photocell for the feed hole level ceased functioning, what effect would this have on tape readability?
1. The computer could only receive the first frame of data from the reader
 2. Only even parity frames could be read from tape
 3. Only even parity data frames could be read correctly from tape
 4. No data could be read from tape at all
- 11-19. What would probably be the first indication that a paper tape station needed cleaning, or that the photolamp might be going bad in the reader station?
1. Tape advances and stops in a jerky fashion
 2. Tape does not advance to first frame
 3. Tape does not move past first frame
 4. Tape moves through reader without stopping
- 11-20. The computer sends a single data word of 6210743574₈ to the PTU after selecting a punch operation. What will actually be punched on tape?
1. The upper seven bits
 2. The upper six bits
 3. The lower seven bits
 4. The lower six bits
- 11-21. The PTU reader senses holes in the tape by use of
1. electromechanical detection
 2. photoelectric sensing
 3. ambient sound reflections
 4. microwave penetration
- 11-22. Which of the following statements is true?
1. A maximum of nine holes is allowed across the width of a one-inch paper tape
 2. Paper tape widths are measured in eighths of an inch
 3. The data levels on paper tape each require a tenth of an inch of actual tape width
 4. Each of the above
- 11-23. Suppose a 30-bit computer word of all 1's (777777777₈) were sent to the RD-231 during a punch operation, and during a later read operation the same frame of data were read back by a computer that has a 30-bit word size. How many bits would be read back from a (a) seven-level tape, and (b) where would these data bits be positioned in the received word?
1. (a) Seven
(b) 00000000000001111111₂
 2. (a) Seven
(b) 1111111000000000000₂
 3. (a) Six
(b) 0000000000000111111₂
 4. (a) Six
(b) 1111110000000000000₂
- 11-24. Suppose a 30-bit word with all 1's data were used to write a frame of data on a six-level paper tape, but that frame of data was read back by a computer that only had an 18-bit word size. What would the input word contain?
1. 000000000000011111
 2. 11111000000000000
 3. 11111000000000000
 4. 00000000000011111
- 11-25. Of the several levels of operation that can be used with the RD-231A, which of these, if any, permits compatibility with tapes from teletypes?
1. The seven level
 2. The six level
 3. The five level
 4. None of the above, as the RD-231A is NOT compatible with tapes produced for or by teletypes

- 11-26. Assume that a seven-level biocatal tape is being planned as the output of a new program. What can the seventh level be used for?
1. For either parity or first frame information
 2. For both parity and first frame information
 3. It can be used as a utility bit
 4. Each of the above
- 11-27. The verification of punched data on paper tape must be accomplished by which of the following?
1. By the program
 2. Within the computer
 3. Both 1 and 2 above
 4. By the reader/punch logic in the RD-231A
- 11-28. How many frames of data will the computer read when the computer's buffer control generates an Input Acknowledge signal?
1. 1
 2. 5, if Biocatal format is used
 3. 10, if Redundant format is used
 4. Both 2 and 3 above
- 11-29. An input from the PTY to the computer is marked by abrupt stop/start motions of the paper tape. Which of the following would be the most probable cause?
1. Delays within the program between inputs
 2. Slow computer I/O sequencing
 3. An improper reader brake adjustment
 4. A slipping reader clutch
- 11-30. The reader has a tape loaded, the incandescent lamp is on, but the motor is not on. The most probable cause is a
1. reader has not been selected
 2. feed hole photodiode has opened
 3. clutch slippage
 4. tape jam
- 11-31. When the reader is stopped, what position does the last data frame received by the computer occupy?
1. One and a half frames beyond the photoelectric diodes
 2. One frame beyond the diodes
 3. One-half frame beyond the photoelectric diodes
 4. Directly over the photoelectric diodes
- 11-32. The rotational rate of the capstan surface will be
1. twice the brake solenoid rate
 2. twice the capstan motor rate
 3. equal to the capstan motor rate
 4. one-half the capstan motor rate
- 11-33. The pinch roller solenoid and the brake solenoid have what timing relationship(s) to each other under normal operating conditions?
1. Only one may be activated at a time
 2. Both may be deactivated at the same time
 3. Both may be activated at the same time
- 11-34. There are a total of (a) seven, eight punch pins in the HSP, and the (b) is notably feed hold, utility different from the remaining holes.
1. (a) Eight (b) utility
 2. (a) Eight (b) feed hole
 3. (a) Seven (b) utility
 4. (a) Seven (b) feed hole
- 11-35. Which of the following is/are the purpose(s) of the magnetic revolver?
1. To provide punch timing
 2. To synchronize data transfers from the computer
 3. To alternate data transfer and punch cycles
 4. All of the above

- 11-36. When punching a "Ø" code, the blocking pawl will _____ (a) _____, and the engage, disengage knee will _____ (b) _____ bend, remain straight.
1. (a) engage
(b) bend
 2. (a) engage
(b) remain straight
 3. (a) disengage
(b) bend
 4. (a) disengage
(b) remain straight
- 11-37. The feed hole punch linkage does NOT have which of the following?
1. Punch pin
 2. Blocking pawl
 3. Long and short toggle arm
 4. All of the above
- 11-38. Which, if any, of the following actions is NOT inhibited by the absence of punchable data?
1. Data hole punches
 2. Feed hole punches
 3. Tape feed
 4. None of the above
- 11-39. The tape feed ratchet will be _____ (a) _____, at the time engage, disengaged data is actually being punched in the frame of tape. This position of the ratchet occurs during the interval when the ratchet is advancing to the next _____ (b) _____ frame, tooth.
1. (a) engaged (b) frame
 2. (a) engaged (b) tooth
 3. (a) disengaged (b) frame
 4. (a) disengaged (b) tooth
- 11-40. Use of the manual tape feed will produce which of the following tapes?
1. A completely blank tape (no data and no feed holes)
 2. An odd parity zeros tape (utility level and feed holes)
 3. A leader (feed holes only)
 4. A utility level tape only
- 11-41. When making mechanical adjustments to the HSP, the freedom of the various moving parts should be verified by rotating the motor shaft _____ (a) _____ clockwise, _____ (as seen from counterclockwise the front) _____ (b) _____ manually, with power applied.
1. (a) clockwise
(b) manually
 2. (a) clockwise
(b) with power applied
 3. (a) counterclockwise
(b) manually
 4. (a) counterclockwise
(b) with power applied
- 11-42. Proper lubrication of the HSP requires the use of which, if any, of the following?
1. Light machine oil
 2. Graphite compound
 3. Silicone grease
 4. None of the above, as the HSP uses self-lubricating parts
- Learning Objective: To learn the function of the OJ-212 teletypewriter and its application in NTDS.*
- 11-43. The OJ-212, previously known as the _____ (a) _____, TTY, UGC-13 (MOD) has an _____ (b) _____, online, offline application in NTDS when running Link 14.
1. (a) TTY
(b) online
 2. (a) TTY
(b) offline
 3. (a) UGC-13 (MOD)
(b) online
 4. (a) UGC-13 (MOD)
(b) offline
- 11-44. Which of the following OJ-212 units is/are a direct maintenance responsibility of DSs?
1. The transmitter-distributor
 2. The page printer and keyboard
 3. The typing and auxiliary typing reperforators
 4. The adapter

11-45. Which of the following is used to drive the teletype printer?

1. A mechanical linkage
2. A constant level d.c. current
3. A constant level a.c. voltage
4. A constant level d.c. voltage

11-46. A nontransmission period would be marked by _____ (a)

current flow, no
_____, and the first
current flow
data "1" would be marked by a
period of _____ (b)

current flow, no
current flow

1. (a) No current flow
(b) No current flow
2. (a) No current flow
(b) Current flow
3. (a) Current flow
(b) No current flow
4. (a) Current flow
(b) Current flow

11-47. In order to clearly distinguish the pulse train, the first pulse must be a _____ (a)

mark, space, and the
last pulse must be a _____ (b)

1. (a) Space (b) space
2. (a) Space (b) mark
3. (a) Mark (b) space
4. (a) Mark (b) mark

11-48. In a basic teletype setup, the various elements of the teletype machines used, communicate through which of the following conditions?

1. A constant level of a.c.
2. A constant level of d.c.
3. A constant level of a.c. voltage
4. A constant level of d.c. voltage

11-49. The OJ-212 pulse train consists of _____ (a) pulses, of which

seven, nine
(b) are used for data.
five, six

1. (a) Nine (b) six
2. (a) Nine (b) five
3. (a) Seven (b) six
4. (a) Seven (b) five

11-50. Which of the following is/are NOT contained in an OJ-212 loop?

1. A computer
2. An adapter
3. A reperforator
4. A keyboard and printer

11-51. Assuming that the OJ-212 was just turned on, and the status of the shift (LTRS or FIGS) position is unknown, what would be the minimum number of shifts needed to insure the printer will print all characters?

1. One
2. Two
3. Three
4. Four

11-52. When the OJ-212 is online and in the K-T position, which of the following equipment would be in use?

1. The tape perforator
2. The keyboard
3. The tape reader
4. All of the above

11-53. Which of the following is NOT a direction of data flow in the OJ-212?

1. Auxiliary reperforator to printer
2. Keyboard to auxiliary reperforator
3. Computer to printer
4. Tape reader to computer

11-54. The adapter maintenance panel has a switch that is placed in the _____ (a) position when

test, offline
using the OJ-212 without the computer, and an _____ (b) switch to

EFR, ACK
allow codes which are manually inserted into the indicators on the adapter's panel to simulate a computer output.

1. (a) Offline (b) ACK
2. (a) Offline (b) EFR
3. (a) Test (b) ACK
4. (a) Test (b) EFR

11-60. The adapter unit is used to provide communications between the (a) and the TTY, data flow register computer in (b) serial or parallel, standard form.

1. (a) TTY
(b) serial or parallel
2. (a) data flow register
(b) serial or parallel
3. (a) TTY
(b) standard
4. (a) data flow register
(b) standard

11-61. The actual format conversion of the information that passes between the teletype unit and the computer is accomplished by which of the following circuits?

1. Function translator
2. Control interface
3. Data flow register
4. Teletype printer

11-62. Which of the following will take place when an Output Acknowledge signal is received by the adapter?

1. The Output Request signal will be disabled
2. Data will be provided for the data flow register
3. The timing chain will be energized
4. All of the above

Items 11-63 is to be judged True or False

11-63. A start pulse from the teletype enables the timing chain which produces timing signals that are used to select data bits that are sent from the adapter to the TTY.

11-64. Of the six functional groups in the adapter, which one generates signals for proper operation of the adapter circuits?

1. Manual controls
2. Function translator
3. Timing chain
4. Clock timing

11-65. What features, if any, of the OJ-212 permits it use with communications equipment or other teletypes?

1. The adapter
2. The auxiliary typing reperforator
3. The auxiliary line relay
4. None

11-66. When inserting a paper roll and a new ribbon in the OJ-212 insure that the paper unrolls from (a) and that the ribbon appears across the (b) of the front, back spools.

1. (a) the top
(b) front
2. (a) the top
(b) back
3. (a) underneath
(b) front
4. (a) underneath
(b) back

Assignment 12

NTDS Peripheral Equipment

Textbook Assignment: DS 3&2, Vol 1, NAVEDTRA 10201-B1, pages 218 through 228

Learning Objective: To describe the MX-3195(V)/USQ-20(V) digital data introducer; its purpose, functions, and basic applications in NTDS.

- 12-1. The MX-3195(V), or keyset, is designed for (a) manual, automatic data insertions on (b) one, various subject(s).
1. (a) manual (b) one
 2. (a) manual (b) various
 3. (a) automatic (b) one
 4. (a) automatic (b) various
- 12-2. The keyset can be easily adapted to new subject matter by changing its (a) plastic overlay, keyboard another one with suitable legends, and by changing its (b) address selector switch setting, readout format as a means of informing the computer of the new mode.
1. (a) plastic overlay (b) address selector switch setting
 2. (a) plastic overlay (b) readout format
 3. (a) keyboard (b) address selector switch setting
 4. (a) keyboard (b) readout format
- 12-3. The use of projection type displays with 12 lamps permits which of the following type displays?
1. Individual letters or number digits
 2. Complete words or messages
 3. Different background colors
 4. Each of the above
- 12-4. Which of the following displays in the keyset uses projection lamps?
1. Numerals 0-9
 2. Code words
 3. Red display without symbology
 4. All of the above
- 12-5. The MSD of the keyset address is determined by the (a) program, input (a), while the LSD of the word format keyset address is determined by the (b) test switch, address switch.
1. (a) program (b) test switch
 2. (a) program (b) address switch
 3. (a) input word format (b) test switch
 4. (a) input word format (b) address switch

12-6. Each message consists of a Message key, a Word key, and six Data keys (digits). Since there are four Message keys, eight Word keys to modify each Message key up to eight ways, and six Data keys to further modify each message/word input up to 10^6 additional ways, the total number of message/word combinations would be

four, eight, thirty-two
while a maximum total of
one million, eight million, thirty-
two million

be generated if each message/word/data input had its own particular meaning.

1. (a) Thirty-two
(b) Thirty-two million
2. (a) Thirty-two
(b) One million
3. (a) Eight
(b) Eight million
4. (a) Four
(b) One million

12-7. A keyset message would consist of which of the following?

1. One of four Message keys
2. One of eight Word keys
3. Any six Data keys
4. All of the above

12-8. An operational program is being reloaded. This makes it necessary to reenter parameters from one of the keysets, but one particular keyset already shows a data entry and its WAIT light is lit. By which, if any, of the following means can the last entry be cleared and the new entry inserted?

1. By turning the keyset's power off, then on again
2. By putting the Test switch in position 3
3. Either 2 or 3 above
4. None, a different keyset will have to be used

12-9. Which of the following statements is NOT true of the transmit button?

1. It locks out further keyboard entries until data is accepted by the KCMX
2. It transmits concluding zeros if the entered data word is incomplete
3. It forces computer acknowledgment of the prepared message
4. It acts as a ready signal for inputting data to the KCMX

12-10. Five keysets, all linked to the NTDS computer through one KCMX on one pair of I/O cables, are all communicating with the computer independently. By which of the following means is the computer able to identify the source of each input?

1. Each keyset is associated with a unique address in the KCMX
2. Each keyset uses a unique address in the data portion of each message
3. Each keyset is restricted to a unique word format within each message
4. Each keyset is restricted to a unique message format

12-11. Which of the following statements is NOT true?

1. Each message is ready for transmission when the transmit key is pressed
2. Each message requires five separate data key insertions
3. Each message requires a word key modifier
4. Each transmission begins with a message key

To answer item 12-12, refer to figure 5-46 in the text.

12-12. The automatic use of (a)
odd, even
parity is included in the (b)
MSB,
of the data word during
LSB
transmission.

1. (a) Even (b) LSB
2. (a) Even (b) MSB
3. (a) Odd (b) LSB
4. (a) Odd (b) MSB

12-13. Which of the following signal sequences will occur following the use of the transmit key on the keyset?

Note: Keypad signals are in ()
KCMX signals are in []
Computer signals are in { }

1. (Enter), {EFA}, [Read], [IDR], {IA}
2. (Enter), [Read], {EFA}, [IDR], {IA}
3. (Enter), [Read], [IDR], {IDA}
4. (Enter), [Read], {IDA}, [IDR]

12-14. Which of the following will NOT occur upon keypad data acceptance by the computer?

1. The Message and Word indicators will clear
2. The Data word will clear
3. The Wait indicator will clear
4. The Control relay will clear

12-15. A new data entry must be preceded by which of the following?

1. A new Message key if it is in a different message group
2. A master Clear of the keypad
3. A new Word key if it is in the same message group
4. All of the above

12-16. Which of the following will also be tested when using the keypad tester and the converter tester to check out a faulty keypad?

1. The KCMX
2. Data lines used by the tester
3. The KCMX to computer lines
4. All of the above

12-17. Which of the following should be considered as causing the faulty symptom when troubleshooting data cables?

1. Open leads
2. Shorted pins
3. Loose connections
4. All of the above

12-18. The only means of actually determining where the fault lies in a data cable is to

1. make resistance checks between the number 1 pins of the cable connectors
2. make resistance checks between two parallel wires by one technician
3. make resistance checks between identical pins in the data cable
4. make resistance checks between the units involved

Items 12-19 and 12-20 are to be judged True or False.

12-19. A good technique for checking for continuity in long cable runs is to wire the ends of parallel wires together and check the opposite ends to see if the resistance is low.

12-20. The keypad tester is equipped with a write signal that is used to transfer the contents of the data storage register to the keypad tester.

12-21. The converter tester will NOT provide which of the following?

1. Manual control of line voltage to the equipment under test
2. A variable source of impedance for decreasing the positive output of the equipment under test
3. Meter indication of line-to-source input voltages
4. An indication of line-to-line output voltages

Learning Objective: To learn the functional aspects of the C-3675A/USQ-20(V) System Monitoring Panel and how it is employed in NTDS.

12-22. One SMP can control or monitor up to how many system computers?

1. One
2. Two
3. Three
4. Four

A. Message
B. Word
C. Data
D. Clear
E. Xmit
F. Wait
G. Error
H. Address
I. None of the above

Figure 12-1

For items 12-23 through 12-26, refer to figures 5-45 and 5-53 in the text, then refer to figure 12-1 above and select the keyset function, if any, that closely resembles the SMP function(s).

12-23. In respective order, the Clear, Xmit, and Wait functions

1. D, E, F
2. E, F, G
3. D, F, G
4. I

12-24. The Identifier/Code

1. A
2. B
3. C
4. H

12-25. The Computer Select

1. A
2. B
3. C
4. H

12-26. The Command

1. A
2. B
3. C
4. H

For items 12-27 through 12-30, select the operation in Column B that is being performed by the computer and which corresponds to the monitor control panel display described in Column A. Operations in Column B are used only once.

	<u>A. DISPLAY</u>	<u>B. OPERATIONS</u>
12-27.	LSB flashing	1. Tape moving forward
12-28.	Light string moving up	2. Data entry error
		3. Program loading
12-29.	lll lll lll lll lll ₂ shown in bit indicator	4. Program is running
12-30.	Changing display	

Assume a particular program (not necessarily an NTDS operational program) makes use of the SMP for the purpose of permitting the contents of various addresses to be changed by storing data from the SMP into them while the program is running. To use this option, the operator selects the CMPTR A (or B, C, or D) message key, then the MODIFY PROG key. (The MODIFY PROG key inhibits normal program execution until another of the eight command modifiers has been selected.) The identifier key (first digit) will specify first an address (INITIALIZE), then the upper 15 bits to be stored in that address (W/DATA), and finally the lower 15 bits to be stored in that address (RESUME). The lower 5 digits must represent, respectively, either the octal equivalent of the address, or the upper or lower 15 bits being stored in that address. After a CMPTR A (or B,C,D)--MODIFY PROG--RESUME--5-digit entry, the program automatically prepares itself to update the next sequential address. Assume that the following three entries have been made using the SMP:

- (1) CMPTR A--MODIFY PROG--INITIALIZE--45112
- (2) CMPTR A--MODIFY PROG--W/DATA--13153
- (3) CMPTR A--MODIFY PROG--RESUME--10012

Figure 12-2

Refer to figure 12-2 in answering items 12-31 through 12-33.

12-31. Upon completion of the last step, the neon indicators on the monitor panel for computer A indicate 100 101 001 001 011₂. This would probably be as a direct result of an (a) output buffer, from the com- external function puter showing the (b) next, last address affected by a modify program sequence.

- 1. (a) output buffer
(b) next
- 2. (a) output buffer
(b) last
- 3. (a) external function
(b) next
- 4. (a) external function
(b) last

12-32. Which of the following sequences would probably follow the CMPTR A - MODIFY PROG key insertions in order to begin storing data into address 45117₈?

- 1. INITIALIZE 45117
- 2. W/DATA 60100
- 3. RESUME 45117
- 4. 045117

12-33. Which of the following sequences would permit normal computer operations to continue following a modify program sequence?

- 1. CMPTR A - MODIFY PROG - STOP
- 2. CMPTR A - MODIFY PROG - CLEAR
- 3. CMPTR A - MODIFY PROG - RESUME
- 4. CMPTR A - OPER CONT

12-34. The SMP generates data for the computer in the form of (a) Command Data, Action Codes which are in reality a form of (b) interrupt, input data because of the control signal generated.

1. (a) Command Data
(b) interrupt
2. (a) Command Data
(b) input data
3. (a) Action Codes
(b) interrupt
4. (a) Action Codes
(b) input data

12-35. An Input Acknowledge signal from the computer will clear both the (a) Identifier/Code and

Wait, Identifier/Code and Command displays, but the

(b) Wait and Select, Command and Select displays will remain

lit to make it easier and faster to make consecutive inputs of similar entries.

1. (a) Identifier/Code and Command
(b) Wait and Select
2. (a) Identifier/Code and Wait
(b) Command and Select
3. (a) Identifier/Code and Command
(b) Command and Select
4. (a) Identifier/Code and Wait
(b) Wait and Select

12-36. What indication would the SMP give an operator when an error condition has occurred on a computer's I/O channel, indicating an abnormal condition (such as an equipment failure, or simply a nonrecoverable error) has occurred?

1. The channel number is constantly lit in the SMP neon indicators
2. The channel number is displayed in an on/off fashion in the SMP neon indicators
3. The corresponding bit for the equipment channel is constantly lit in the SMP neon indicators
4. The corresponding bit for the equipment channel is displayed in an on/off fashion in the SMP neon indicators

12-37. Which, if any, of the following would be a special requirement when troubleshooting proper SMP operation?

1. Test equipment
2. Tools and techniques
3. Maintenance programs
4. None of the above

12-38. DELETE

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