



NATIONAL AEROSPACE STANDARD

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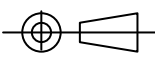
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REVISION DATE.

FORM 09-01

THIRD ANGLE PROJECTION		CUSTODIAN ENGINEERING MANAGEMENT COMMITTEE	REVISION 3
PROCUREMENT SPECIFICATION NONE	TITLE ELECTRICAL HARNESS ASSEMBLING MACHINE, NUMERICALLY CONTROLLED	CLASSIFICATION SPECIFICATION NAS974	SHEET 1 OF 16

ISSUE DATE: MAY 1965
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1.0 SCOPE

- 1.1 Purpose: This specification provides a standard for the manufacture, performance, reliability, inspection and procurement of a general purpose aircraft and missile wire harness assembling machine. This standard lists minimum requirements and is not to limit design advances.
- 1.2 Classification: The machine shall be of the following type, size and class of controls.
- 1.2.1 Type: Electrical Harness Assembling Machine, Numerically Controlled.
- 1.2.1 The machine shall handle all types of electrical wire and cable normally associated with aircraft and missile manufacture with the exception of semi-rigid and rigid electrical conductors.
- 1.2.2 Size: The machine shall be capable of handling wire gages from ASW #26 to ASW #10 and lengths from 12 to 2400 inches.
- 1.3 Intended Use: The machine described by this specification is intended for use in the aerospace manufacturing industry for the assembly of electrical harnesses exclusive of hardware.

2.0 APPLICABLE SPECIFICATIONS, CODES AND STANDARDS

- 2.1 The Joint Industrial Council (JIC) Electrical Standards for General Purpose Machine Tools, EGP.1.1.1967.
- 2.2 The Joint Industrial Council (JIC) Hydraulic and Pneumatic Standards for Industrial Equipment.
- ② 2.3 National Electrical Code (NEC)
- 2.4 National Aerospace Std. (NAS) 938, Machine Axis and Motion Nomenclature
- 2.5 National Aerospace Standard 955, Interchangeable Perforated Tape Standards Variable Block Format for Numerically Controlled Equipment.
- 2.6 National Aerospace Standard 972, Glossary of Manufacturing Equipment Terms.
- 2.7 Electronics Industries Association (EIA) Construction Standards, Numerical Machine Tool Control, No. RS-281 and SP-621 Tape Format.

LIST OF CURRENT SHEETS

NO.	REV.	NO.	REV.	NO.	REV.
1	2	6	NEW	11	1
2	1	7	NEW	12	NEW
3	NEW	8	1	13	2
4	NEW	9	1	14	1
5	NEW	10	NEW	15	NEW

②

CUSTODIAN: MANUFACTURING COMMITTEE

PROCUREMENT
SPECIFICATION

NONE

TITLE

ELECTRICAL HARNESS ASSEMBLING MACHINE,
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SPECIFICATION

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- 2.8 Occupational Safety and Health Standards, Part 1910 of Chapter XVII of Title 29 of the Code of Federal Regulations. Ref: Occupational Safety and Health Act (OSHA) - 1970.
- 2.9 State and Local Safety and Electrical Codes

3.0 REQUIREMENTS

- 3.1 Design: The manufacturer has the choice of configuration and the functional operation of the machine, except where specifically stated in this specification.
- 3.2 Type, Size, Class (See paragraphs 1.2.1 and 1.2.2)
- 3.3 Machine Sub-Assemblies
 - 3.3.1 The machine shall have three (3) major sections as follows:
 - 3.3.1.1 Wire Holding Racks which will be manually or automatically loaded with processed wire in a predetermined sequence. Processed wire is defined as wire cut to length, identified, terminalized and coiled.
 - 3.3.1.1.1 Racks shall contain compartments into which the processed wire can be quickly placed for pick-up and routing.
 - 3.3.1.1.2 Racks shall be portable, and when loaded with processed wire shall be attached to the wire routing section.
 - 3.3.1.2 Wire Routing Section shall consist of a routing device which picks up the processed wire, indexes one (1) end on a peg board and routes the wire to the desired configuration.
 - 3.3.1.2.1 When all wires have been routed, the peg board shall automatically move to the harness tying section.
 - 3.3.1.3 Harness Tying Section shall consist of a tying device which moves to programmed positions and ties the harness.
 - 3.3.1.3.1 After all harness ties have been made, the peg board shall automatically move to the unloading position.
 - 3.3.2 Machine Controls
 - 3.3.2.1 Numerical Control System: The machine shall be equipped with AIA Class III, solid state, including integrated circuits, closed loop numerical control system for controlling all movements specified in Section 3.3.
 - 3.3.2.2 The system shall be arranged for operation in manual and automatic modes.

① Completely Revised

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- 3.3.2.3 Programming shall be accomplished by laying out a sample harness on a programming peg board.
- 3.3.2.3.1 Programming peg board shall meet the recommended requirements:
1. Size, 8 x 20 feet ($\pm 1/2$ inch).
 2. Degree of incline, as required.
 3. Pegs, on 1-1/8 inch center over entire surface with 1 inch border.
 4. Pegs, shall be 1/4 inch diameter, 2 inches high, and spherically topped.
 5. Peg board, shall be lined from peg to peg (horizontally and vertically only) and each 1-1/8 x 1-1/8 inches square thereby created shall be identified by coordinates (or appropriate code).
- 3.3.2.3.2 Progressive coordinates will provide the routing data.
- 3.3.2.3.3 Selected coordinates will provide tying locations.
- 3.3.2.3.4 Routing data and required machine commands shall constitute all programming information required to numerically control the routing section.
- 3.3.2.3.5 Tying locations and required machine commands shall constitute all programming information required to numerically control the tying section.
- 3.3.2.3.6 All machine commands required to provide numerical control shall be furnished by the manufacturer.
- 3.3.2.3.7 A single format for recording program information and subsequently converting this information into punched tape on a tape punch typewriter shall be provided.
- 3.3.2.3.8 Punched tape (paragraph 3.3.2.3.7) shall be used directly on the subject machine without further programming or processing.
- 3.3.2.3.9 Programming peg board (paragraph 3.3.2.3.1) and format (paragraph 3.3.2.3.7) shall be delivered to coincide with the training requirement in paragraph 6.1.5.
- 3.3.2.4 Operator's Controls: All operating control switches or levers shall be located convenient to the operator when he is in the normal and established operating positions.
- 3.3.2.4.1 The machine shall have a main control console and a maximum of three (3) secondary consoles for the Router, Tie and Unload stations.
- 3.3.2.5 The main console shall contain tape readers, show all interlock and indicator lights, and have all general purpose controls.

CUSTODIAN: Manufacturing Equipment Committee

PROCUREMENT
SPECIFICATION

None

TITLE

ELECTRICAL HARNESS ASSEMBLING MACHINE,
NUMERICALLY CONTROLLEDCLASSIFICATION
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AIA AND ITS COMMITTEES WILL NOT INVESTIGATE THE APPLICABILITY OF PATENTS TO THE SUBJECT MATTER OF NAS STANDARDS AND IN RESPECT THEREOF DO NOT ASSUME ANY LIABILITY TO PATENT OWNERS OR TO PROSPECTIVE USERS.

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- 3.3.2.6 The Router Console shall have the following:
- 3.3.2.6.1 Stop and restart routing buttons.
 - 3.3.2.6.2 Indicator light for in-process tying.
 - 3.3.2.6.3 Emergency stop.
 - 3.3.2.6.4 Interlock light for no wire in router.
 - 3.3.2.6.5 Indicator light for end of run.
 - 3.3.2.6.6 Indicator light for no peg board in blank.
 - 3.3.2.6.7 Indicator light for peg board in tying station.
- 3.3.2.7 The Tyer Console shall have the following:
- 3.3.2.7.1 Stop and restart Tyer gantry buttons.
 - 3.3.2.7.2 Emergency stop.
 - 3.3.2.7.3 Tyer on manual. Jog buttons shall be on Tyer for manually actuating Tyer.
 - 3.3.2.7.4 Interlock light for no Tyer material.
 - 3.3.2.7.5 Indicator light for peg board in unload station.
 - 3.3.2.7.6 Peg board advance button (from Tyer station to unload station only). This control shall be automatically deactivated when the Tyer section is in a programmed status.
- 3.3.2.8 The Unload Station console shall have the following:
- 3.3.2.8.1 Peg board advance button (from unload station to Blank Station only). This control, when activated, will immediately move the peg board if the Blank Station is clear, or will move it as soon as the Blank Station is cleared.
 - 3.3.2.8.2 Emergency stop.
- 3.3.2.9 Start button on main console shall begin sequence of all harness assembling operations. Start buttons on secondary consoles shall start only the operations associated with their respective stations.
- 3.3.2.10 Emergency Stop (large red button) shall stop all operations. Stop buttons for specific operations shall stop only that operation. None of the stop buttons shall interrupt the processing cycle. Restarting shall resume operation where it was stopped.

CUSTODIAN: Manufacturing Equipment Committee

PROCUREMENT
SPECIFICATION

None

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APPROVAL DATE May 1965 REVISION