

Digital Computer Laboratory  
Massachusetts Institute of Technology  
Cambridge 39, Massachusetts

SUBJECT: PROPOSAL: WIRING AND CONSTRUCTION PRACTICE SPECIFICATIONS FOR JOINT  
IBM-MIT USE

To: Group 62-Project High Engineers

From: C. W. Watt

Date: June 5, 1953

Abstract: A meeting of the Joint IBM-MIT Standards Committee on Materials and Processes, held June 4 at M.I.T., agreed on certain soldering and wiring methods. The area of agreement was wide, and the following text outlines what was decided by the committee. This memo is a proposal. Its contents should be criticized by both MIT and IBM personnel, and criticisms given to Edwards of IBM or Watt of MIT by Friday, June 19, so that final standards can be issued shortly.

The Joint MIT-IBM Materials and Processes Standards Committee met Thursday, June 4, at M.I.T. Present were N. P. Edwards, C. M. Balliet, and D. G. Lawrence of IBM; and C. W. Watt, J. D. Bassett, and W. H. Ayer of M.I.T.

The meeting concerned itself primarily with wiring methods. The following agreements were reached in the committee. They are presented here for criticism before the text of a wiring methods standard is formally written up.

1.0 General

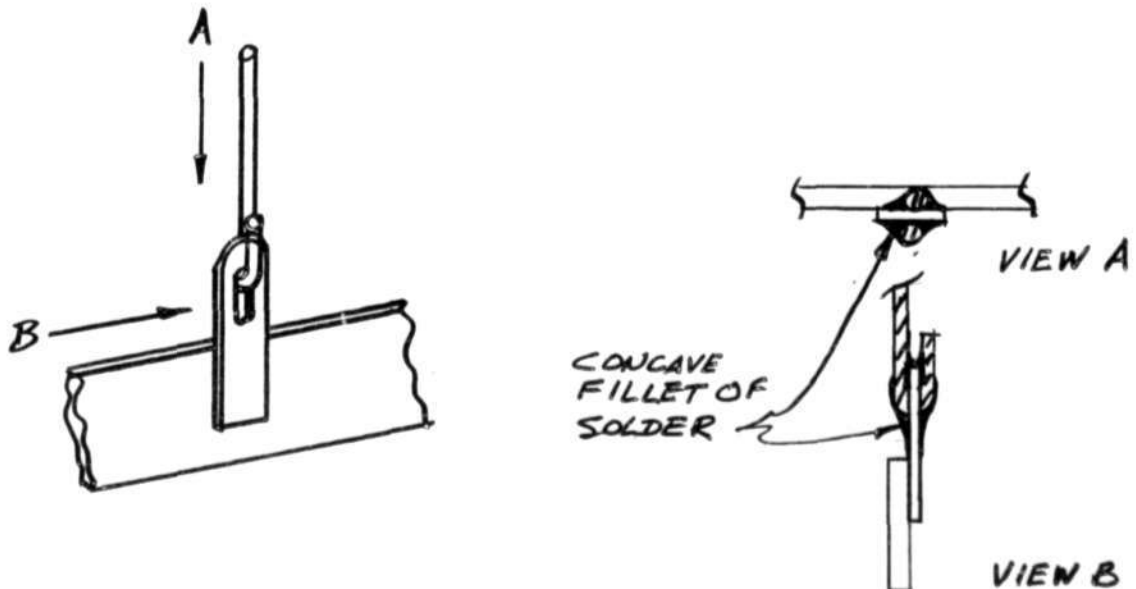
- 1.1 The general MIL Specs applicable to Air Force equipment should be adhered to except
  - a) Where more stringent requirements that would improve equipment reliability seem necessary
  - b) When certain portions are clearly not applicable to the proposed equipment.

The general specs are MIL-E-4158 for Ground Based Equipment, and MIL-E-5400, for Airborne Equipment. (The Bureau of Ships General Spec., 16-E-4, while not directly applicable, is useful for reference).

2.0 Soldering

- 2.1 Solder lugs shall be as small as possible to reduce thermal inertia and thus reduce excessive heating of components.

- 2.2 The design of soldering lugs for pluggable units shall be such that
1. The components are held mechanically in place before soldering.
  2. There will be a comparatively large contact area between the component pigtail and the lug, to permit an area of solder flow.
  3. The finished solder connection shall be completely visible for inspection.
- 2.3 Wires connecting to solder lugs on tube sockets, power plugs, or other components shall be pushed thru the hole in the lug, bent a minimum of  $180^\circ$  around the lug, and pressed mechanically tight before soldering, unless this will mechanically damage the component to which the wire is being attached.
- 2.4 The pigtails of small components attached to open bus wiring (as in a matrix) shall be wrapped one turn around the bus wire ( $270^\circ$  to  $360^\circ$ ) before soldering.
- 2.5 No tube socket pins shall be bent over and soldered to ground.
- 2.6 Solder with non-corrosive rosin tri-core flux and 60% tin - 40% lead composition shall be used.
- 2.7 All soldered joints shall be made with a minimum of solder, but the solder must flow onto the wire and the lug to form a smooth concave joint; i.e., all metal surfaces shall be thoroughly wetted with solder, and a concave fillet of solder shall be visible wherever there is a junction (See sketch).



- 2.8 All other limitations on soldering included in MIL-E-4158 shall be adhered to, and will be included in the final specification.

3.0 Component Assembly

3.1 Order of assembly

In assembling any electronic components onto terminal boards, the following order should be followed to minimize heat damage to the components.

1. Wiring, external and jumper.
2. Screwed down components.
3. Capacitors and composition carbon resistors.
4. Deposited carbon resistors.
5. Diodes.

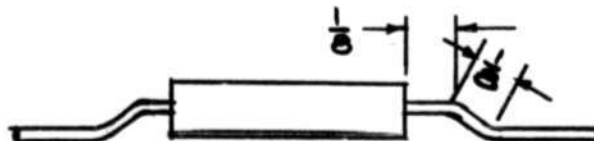
If soldering of external wiring must be done on a board after it is installed, diodes shall be omitted entirely until everything else is done, and shall be put on last.

3.2 Heat Clamps

Heat clamps or shunts shall be used when all deposited carbon resistors or diodes are installed, and it is recommended that they be used on all components to minimize heat damage.

3.3 Assembly on terminal boards

1. No component shall be pigtail supported only at plugs, tube sockets, or other large components. Both ends shall be firmly supported on a terminal board. Exceptions may be made, but must be approved by the Materials and Processes Standards Committee. One exception that is approved, by necessity, is the connection of parasitic oscillation suppression resistors from a terminal board directly to a tube socket.
2. All components shall have a strain - relieving bend put in each pigtail before assembly onto terminal boards. This shall be approximately per the sketch below:



#### 4.0 Wire Types and Sizes

##### 4.1 Solid Wire

1. Solid bus bar wire with spaghetti insulation may be used where convenient when the lead length is 4" or less. Preinsulated solid wire needing stripping shall not be used because of the danger of nicking and subsequent future failure.
2. When excessive relative motion may exist between the wire and its connection point, stranded wire (which is more flexible than solid wire) should be used.
3. Solid non-insulated bus wire in any length or size may be used where good design suggests it, providing it is supported often enough to preclude its being bent in service.

4.2 Stranded insulated wire shall be used for all leads over 4" in length unless permanent fixed, non-insulated bus wire is used as above. The ends of all insulated stranded wire must be stripped, and the tips of the wire tinned before the wire is used.

##### 4.3 Wire Sizes

1. Power and service wiring in chassis or pluggable units shall in general be #22 or larger.
2. Heater wires to sockets should in general be no smaller than #16 ga. and should be stranded and insulated.
3. When stranded insulated wire is used for signal wiring inside a pluggable unit or chassis, it shall in general be #24 gauge.

#### 5.0 Solderless Lugs

5.1 IBM edge connectors using lugs crimped to stranded wire, as used in standard IBM equipment, are approved for use, with the following qualifications:

1. The use of an insulating sleeve over the crimp-on section should be investigated.
2. The advisability of increasing the spacing of the connections in the connector block should be investigated.

5.2 Solderless lugs in general are approved for use with insulated stranded wire between #22 and #14 gauge. Both ring and spade types are acceptable, but spade types should have a hook on

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the end of each finger. Screws on terminal strips should be equipped with captive lockwashers, as in "sems" screws.

Signed: C. W. Watt  
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