

# engineering TUBE DATA

X-282  
TRAVELING  
WAVE TUBE



*Components Division*

## T E N T A T I V E

### DESCRIPTION:

THE X-282 IS A 10 WATT CW TRAVELING WAVE AMPLIFIER TUBE IN THE 4.0 TO 8.0 FREQUENCY RANGE AND HAVING 25 DB GAIN WHEN OPERATED AS A LOW-LEVEL AMPLIFIER. IT IS CONSTRUCTED IN A RUGGED METAL ENVELOPE WITH A HELIX-TYPE SLOW-WAVE STRUCTURE. THE INTEGRAL MATCHING CIRCUIT IS IN 50 OHM COAXIAL LINE AND IS PROVIDED WITH FEMALE TNC CONNECTORS. THE TUBE IS SELF-ALIGNING IN THE EXTERNAL SOLENOID, WHICH IS REQUIRED TO PROVIDE A UNIFORM MAGNETIC FIELD. A CONVERGENT BEAM GUN AND OXIDE COATED CATHODE ARE USED.

### ELECTRICAL INFORMATION:

|                                   |           |         |
|-----------------------------------|-----------|---------|
| HEATER VOLTAGE                    | 6.3 (±5%) | VOLTS   |
| HEATER CURRENT                    | 1.5       | AMPERES |
| MAXIMUM FREQUENCY                 | 8.0       |         |
| MINIMUM FREQUENCY                 | 4.0       |         |
| MINIMUM COLD TRANSMISSION LOSS    | 55        | DB      |
| CAPACITANCE                       |           |         |
| CONTROL ELECTRODE TO ALL ELEMENTS | 15        | UUF     |

### ELECTRICAL RATINGS, ABSOLUTE VALUES

|                                                     |      |       |
|-----------------------------------------------------|------|-------|
| MAXIMUM ANODE VOLTAGE (NOTE 1)                      | 3000 | VOLTS |
| MAXIMUM HELIX CURRENT (NOTE 2)                      | 2    | MA    |
| MAXIMUM COLLECTOR DISSIPATION (BEAM POWER) (NOTE 3) | 196  | WATTS |
| MAXIMUM POSITIVE CONTROL ELECTRODE VOLTAGE          | 0    | VOLTS |

### MECHANICAL:

|                          |                           |
|--------------------------|---------------------------|
| TYPE OF CATHODE          | OXIDE COATED UNIPOTENTIAL |
| GUN CONNECTIONS          | FLYING LEADS              |
| R-F CONNECTIONS          | FEMALE TNC                |
| MAGNETIC FIELD STRENGTH  | 1200 GAUSS                |
| MOUNTING POSITION        | ANY                       |
| WEIGHT (TUBE ONLY)       | 14 OUNCES                 |
| TYPE OF COOLING (NOTE 4) | WATER OR AIR              |



ELECTRON TUBE DEPARTMENT  
**COMPONENTS DIVISION**

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

10-60

P. O. BOX 412, CLIFTON, NEW JERSEY

TYPICAL OPERATION:

AS POWER AMPLIFIER

|                           |      |       |
|---------------------------|------|-------|
| FREQUENCY                 | 6    |       |
| ANODE VOLTAGE             | 2600 | VOLTS |
| ANODE CURRENT             | 55   | MA    |
| HELIX CURRENT             | 1.0  | MA    |
| CONTROL ELECTRODE VOLTAGE | 0    | VOLTS |
| POWER OUTPUT              | 10   | WATTS |
| GAIN                      | 28   | DB    |
| DUTY                      | 1.0  |       |

AS LOW LEVEL AMPLIFIER

|                           |      |       |
|---------------------------|------|-------|
| FREQUENCY                 | 6    |       |
| ANODE VOLTAGE             | 2550 | VOLTS |
| ANODE CURRENT             | 53   | MA    |
| HELIX CURRENT             | 1.0  | MA    |
| CONTROL ELECTRODE VOLTAGE | 0    | VOLTS |
| POWER OUTPUT              | 300  | MW    |
| GAIN                      | 33   | DB    |
| DUTY                      | 1.0  |       |

NOTE 1: ALL VOLTAGES SHOWN ARE WITH RESPECT TO CATHODE. ANODE AND COLLECTOR ARE CONNECTED INTERNALLY TO THE SHELL, AND THE OUTER COAX CONDUCTOR OF THE R-F CONNECTIONS IS ALSO AT SHELL POTENTIAL. THE HELIX IS CONNECTED TO THE CENTER CONDUCTOR OF THE COAX LINE AND A D-C CONNECTION TO THE HELIX MUST BE PROVIDED EXTERNALLY IN THE R-F CIRCUITRY.

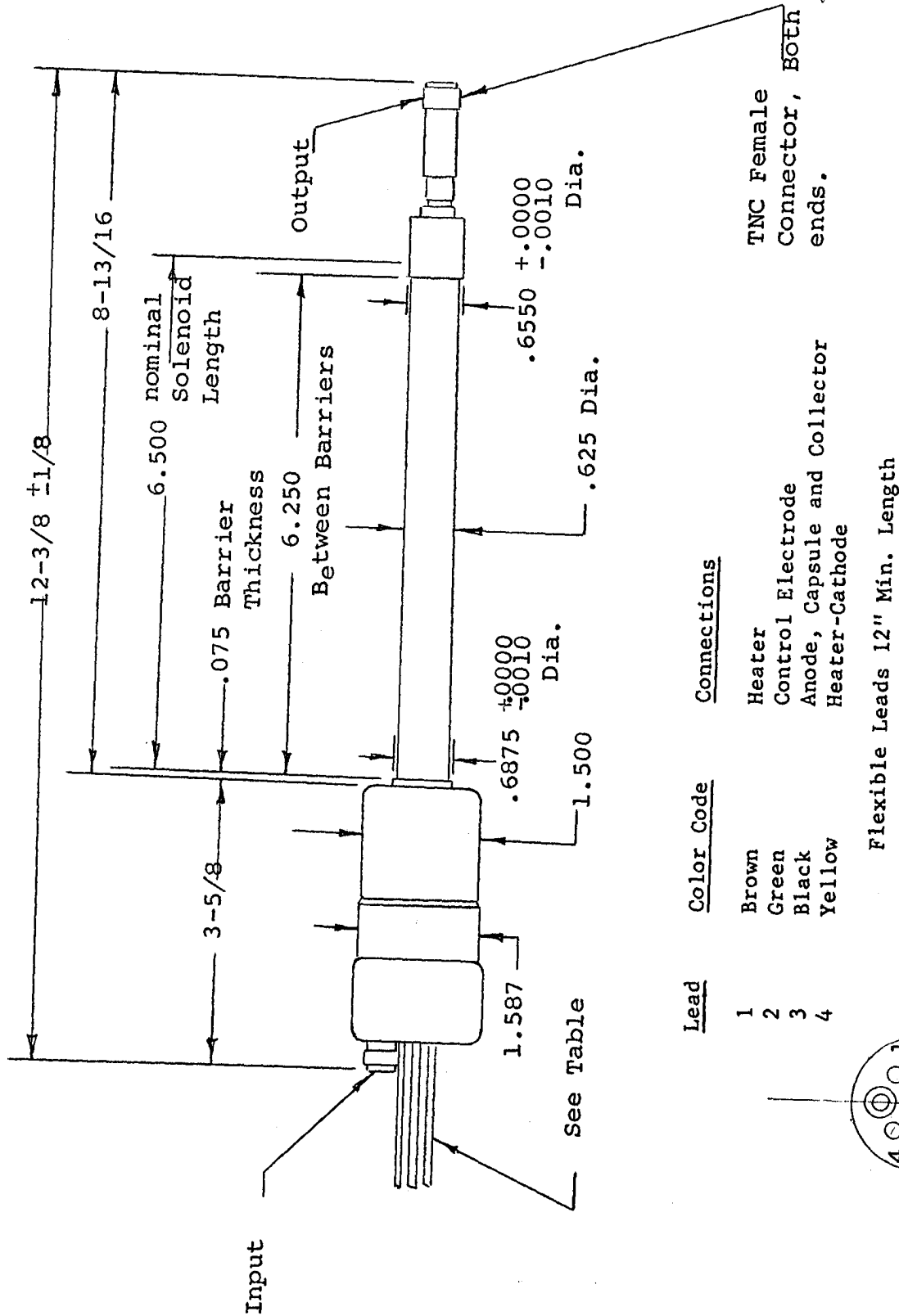
NOTE 2: THE HELIX CURRENT SHOULD BE MINIMIZED AND MUST BE LESS THAN THE MAXIMUM RATING. IT IS DESIRABLE TO MONITOR THIS CURRENT DURING OPERATION AND TO PROVIDE OVERLOAD PROTECTION.

NOTE 3: THE BEAM VOLTAGE SHOULD BE APPLIED TO THE TUBE ONLY AFTER THE MAGNETIC FIELD IS TURNED ON AND WATER OR AIR IS FLOWING THROUGH THE COLLECTOR COOLING JACKET.

NOTE 4: COOLING METHOD DEPENDS ON TYPE OF COLLECTOR COOLING JACKET USED.

ADDITIONAL INFORMATION FOR SPECIFIC APPLICATIONS CAN BE OBTAINED FROM THE:

ELECTRON TUBE APPLICATIONS SECTION  
ITT COMPONENTS DIVISION  
POST OFFICE BOX 7065  
ROANOKE, VIRGINIA



OUTLINE - X-282 TRAVELING WAVE TUBE

**ITT** ELECTRON TUBE DEPARTMENT  
**COMPONENTS DIVISION**

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

P. O. BOX 412, CLIFTON, NEW JERSEY

10-60



**ELECTRON TUBE DEPARTMENT ■ COMPONENTS DIVISION**  
INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION, CLIFTON, NEW JERSEY

TRAVELING  
WAVE TUBE

### OPERATING INSTRUCTIONS FOR THE X-282 TRAVELING WAVE TUBE

THE X-282 IS A 10 WATT CW TRAVELING WAVE TUBE OPERATING OVER THE BAND OF 4 TO 8 KMC. IT REQUIRES A MAGNETIC FIELD OF 1200 GAUSS FOR PROPER FOCUSING. BASIC POWER REQUIREMENTS ARE 70 MA AT 2800 V AND A 50 VOLT BIAS SUPPLY, AS WELL AS 6.3 V AT 2.2 AMPS FOR THE HEATER.

WHEN PLACING THE X-282 IN OPERATION FOR THE FIRST TIME, THE FOLLOWING PROCEDURE SHOULD BE FOLLOWED:

1. MAKE A VISUAL INSPECTION OF THE TUBE TO CHECK FOR LOOSE CONNECTIONS OR OTHER MECHANICAL DEFECTS.
2. PLACE THE TUBE IN THE PROPER SOLENOID AND MAKE CONNECTIONS TO THE TUBE AND SOLENOID. OBSERVE COLOR-CODING OF THE TUBE LEADS AND POLARITY MARKING ON THE SOLENOID.
3. APPLY COOLING TO THE SOLENOID AND TO COLLECTOR.
4. APPLY THE FOLLOWING VOLTAGES IN THE FOLLOWING ORDER:
  - 4.1 HEATER VOLTAGE (6.3 VOLTS).
  - 4.2 SOLENOID VOLTAGE (ADJUST SOLENOID CURRENT TO YIELD 1200 GAUSS).
  - 4.3 CONTROL ELECTRODE VOLTAGE (APPLY BIAS VOLTAGE SPECIFIED ON DATA SHEET SUPPLIED WITH TUBE.)
  - 4.4 CATHODE VOLTAGE (ADJUST SLOWLY TO THE VALUE INDICATED ON THE DATA SHEET; USUALLY ABOUT MINUS 2700 VOLTS WITH RESPECT TO THE SHELL. AT ALL TIMES MONITOR HELIX CURRENT AND OBSERVE THE 2.0 MA MAXIMUM LIMIT.)
5. R.F. INPUT SHOULD BE LIMITED TO 200 MW.
6. THE CATHODE VOLTAGE MAY BE OPTIMIZED FOR OPTIMUM POWER OUTPUT AT THE DESIRED FREQUENCIES.

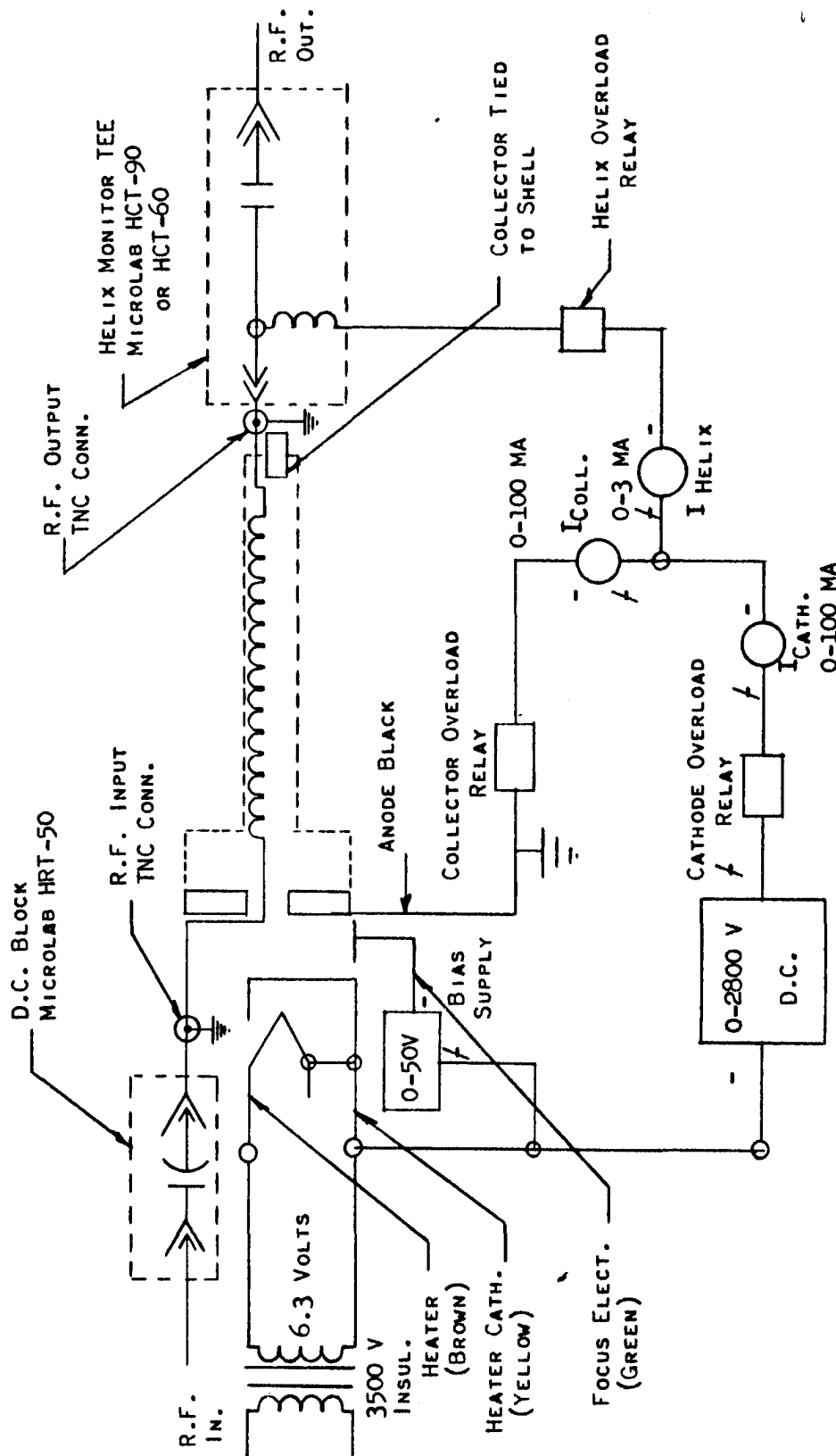
X-282  
TRAVELING  
WAVE TUBE

- 2 -

THE FOLLOWING PRECAUTIONS SHOULD BE TAKEN WHEN OPERATING THE TRAVELING WAVE TUBE:

1. NEVER OPERATE THE X-282 WITHOUT PROPER MAGNETIC FIELD. BE SURE SUFFICIENT COOLING IS SUPPLIED TO TUBE AND SOLENOID.
2. NEVER OPERATE THE X-282 WITH HELIX CURRENT IN EXCESS OF 2.0 MA. UNDER MOST CONDITIONS HELIX CURRENT WILL BE 1.0 MA OR LESS. IT IS IMPORTANT THAT HELIX OVERLOAD PROTECTION BE PROVIDED.
3. BE SURE COAXIAL CABLES TO BE CONNECTED TO THE TUBE INPUT AND OUTPUT CONNECTORS ARE ASSEMBLED CORRECTLY. IF THE INNER CONDUCTOR OF THE CABLE CONNECTOR IS TOO LONG, PRESSURE WILL BE APPLIED TO A CERAMIC BEAD, WHICH MAY CAUSE DAMAGE TO THE TUBE. IF IT IS TOO SHORT, A POOR CONNECTION WILL RESULT CAUSING POOR R.F. PERFORMANCE.

THE ATTACHED SCHEMATIC IS A SUGGESTED METHOD OF CONNECTING THE X-282 AND SHOWS THE LOCATION OF PROTECTION CIRCUITS AND METER POLARITY.



**NOTES:**

1. ALL OVERLOADS OPERATE TO DISCONNECT HIGH VOLTAGE SUPPLY.
2. HELIX MONITOR AND D.C. BLOCK TO BE SUPPLIED BY USER.

BASIC SUPPLY AND METERING  
REQUIREMENTS FOR X-282  
TWT AMPLIFIER