

INIVEN™

IT-10 AM TONE TRANSMITTER

INSTRUCTION MANUAL

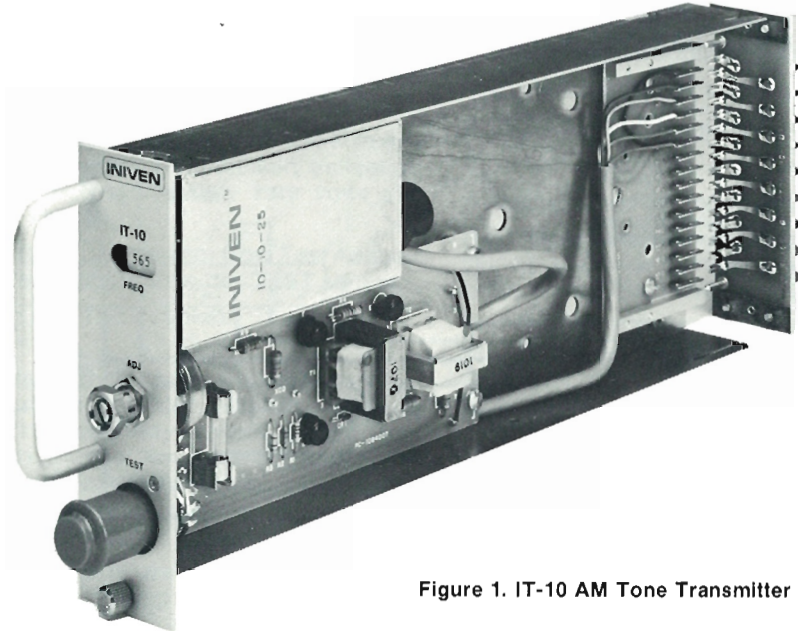


Figure 1. IT-10 AM Tone Transmitter

1. DESCRIPTION (See Figure 1)

1.1 The IT-10 is an AM tone transmitter for use in remote supervisory control, telemetry, and data transmission applications. When keyed by an external contact closure, the transmitter emits an audio tone at the frequency specified for that particular unit. The keying terminals are located on a terminal block on the rear of the transmitter.

1.2 The frequency of transmission is determined by a plug-in oscillator tank circuit module (IO-10). The IO-10 bears a number denoting its resonant frequency (in Hz). This number appears in a front-panel cutout when the module is installed.

2. SPECIFICATIONS

Output Level: +5 DBM maximum, continuously adjustable

Output Impedance: 600 ohms nominal with rising characteristics out of band.

Keying: Dry contact closure; approximately 5 mA drawn through keying contacts.

Keying Speed: Limited by receiver—30 PPS when using 100 Hz channel spacing; higher speeds on wider channels

Frequency Range: 365 Hz to 3000 Hz (refer to Table 8-2 for complete list of available frequencies)

Channel Spacing: 100 Hz STD., For Others refer to Table 8-2.

Output Quality: No harmonics or hum greater than 42 DB below fundamental output

Power Requirement: 12 VDC \pm 10%

Power Drain: 16 mA standby, 20 mA transmitting at 12 Vdc

Protection: ½ A fuse (type 8 AG), located on printed circuit board A1; protects against excessive current drain within transmitter module

Temperature Range: -30°C to +60°C

Weight: 2¼ lb. approx. (1 Kg)

CAUTION

Although this transmitter is completely interchangeable with any other INIVEN™ IT-10 AM transmitter, its components may not be interchangeable with those of other units. Check all components before attempting any substitutions.

3. FEATURES

3.1 Output Level Adjustment—an output level adjustment (ADJ) control is accessible on the front panel of the IT-10. This screwdriver-adjustment allows the transmitter output level to be adjusted up to a maximum of +5 DBM.

3.2 Test Socket—A TEST socket is located on the IT-10 front panel. For normal operation, a plug is installed in this socket. When the plug is removed for testing, the transmitter output is disconnected from terminals 3 and 4 of the terminal block. The TEST socket provides access to the following functions.

PIN NUMBER	FUNCTION
1 and 2	Tone output
3	Positive side of 12 Vdc power supply input
4	Negative side of 12 Vdc power supply input
3 and 7	Keying input

4. THEORY OF OPERATION (See Figure 2)

4.1 The IT-10 transmitter consists of a stable and audio oscillator, a push-pull power amplifier, and a line-coupling network. The line-coupling network and oscillator tank circuit are contained within plug-in module IO-10.

4.2 The oscillator is composed of transistor Q1; biasing resistors R1, R2 and R3; and oscillator tank circuit IO-10. The oscillator is in continuous operation as long as power is applied. The oscillator output signal appears across potentiometer VR1 and is applied to emitter follower Q4. The emitter follower isolates the oscillator circuit from load variations. Transformer T1, in the emitter circuit Q4, couples the signal to the push-pull power amplifier which consists of

transistors Q2 and Q3 (connected in a common base configuration), output transformer T2, and biasing network CR1 and R6. Diode CR1 and resistor R6 hold the bases of Q2 and Q3 slightly negative to eliminate cross-over distortion. The amplifier is in operation only when the emitters of Q2 and Q3 are returned to B+ through the keying contacts.

4.3 The output of the push-pull amplifier is coupled to the line-coupling network by transformer T2. The line-coupling network isolates the transmitter from voltage variations on the transmission line and presents a 600-ohm output impedance to the line at the minimal frequency. Swamping resistor R7 ensures that a constant impedance is presented to the line-coupling network.

4. At the rear of the frame, use the 6-32 screws provided to fasten the terminal block securely to the frame. The IT-10 can now be removed from (and installed into) the frame by using the front-panel knurled retaining screw.

5.2 Terminal Block Connections

All electrical connections are made to the terminal block at the rear of the frame (see Figure 3):

TERMINAL	FUNCTION
1	Positive (+) side of 12 Vdc power supply input
2	Negative (-) side of 12 Vdc power supply input
3 and 4	Tone output
5 and 6	Keying input

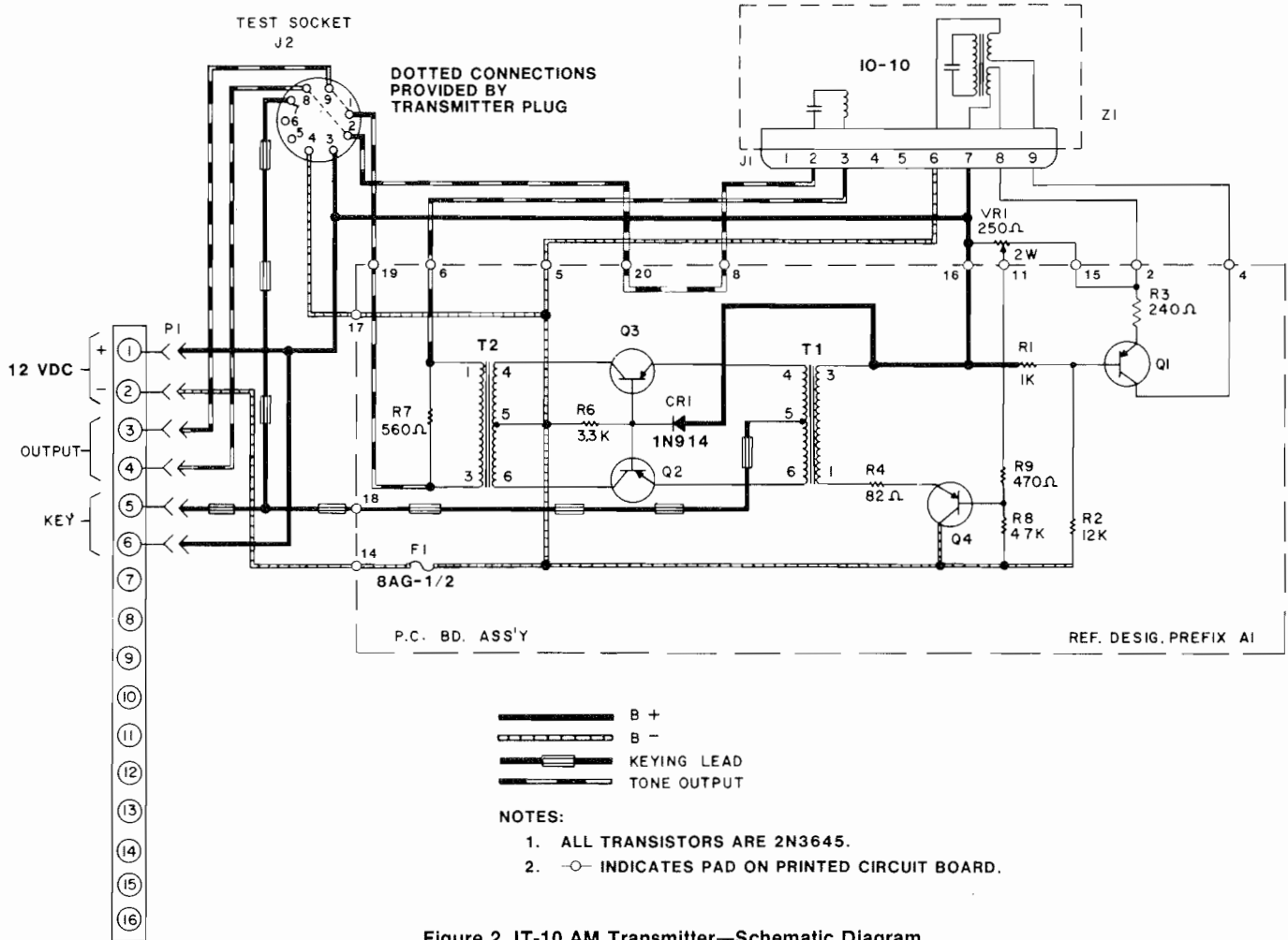


Figure 2. IT-10 AM Transmitter—Schematic Diagram

5. INSTALLATION

5.1 Mechanical Installation

The IT-10 transmitter is shipped with the IO-10 tank circuit (Module Z1) mounted in place, the transmitter plug inserted into the TEST socket, the terminal block assembly plugged into the connector TB1 and four 6-32 screws partially screwed into the terminal block.

The transmitter is normally mounted in an IX-3 or IX-11 mounting frame, or into a cradle-type frame. To install the transmitter into the frame, proceed as follows:

1. Remove 6-32 screws from terminal block.
2. Push transmitter with terminal block attached into frame.
3. Secure the transmitter to the frame, using the knurled retaining screw on the front panel. Precaution must be taken when aligning the front panel screw with the hole in the frame to prevent damage to the front panel.

NOTE

Connecting terminals 5 and 6 by way of the external circuit keys the tone "on." (Terminal 6 is connected internally to terminal 1, the B+.)

7 thru 16 Not used

5.3 Output Level Adjustment

The following equipment is required to set the output level of the IT-10 AM Tone Transmitter

Test Adapter	INIVEN	TA
Multimeter	Simpson	Model 260 (or equivalent)

NOTE

If Test Adapter is not available, take measurements directly from TEST socket.

5.4 Adjustment Procedure—Adjust the output level of the transmitter as follows:

1. Remove transmitter plug from TEST socket of transmitter.
2. Insert plug of Test Adapter into TEST socket of transmitter.
3. Install a 600 ohm resistor between terminals 1 and 2 of Test Adapter.
4. Set Multimeter to 2.5 Vac scale and insert test leads into jacks 1 and 2 of Test Adapter.
5. Install a jumper between terminals 3 and 7 of the Test Adapter.
6. Rotate ADJ potentiometer, on front panel of transmitter, to obtain a Multimeter indication in accordance with Table 8.1.
7. Alternately remove and replace installed jumper to terminal 7 of Test Adapter while observing Multimeter. Indication should alternate between approximately zero volts and indication obtained in step (6).
8. Remove jumpers, test leads, and resistor from Test Adapter and unplug Test Adapter from transmitter TEST socket.
9. Insert transmitter plug into TEST socket.

5.5 Electrical Grounding

To reduce ground loop interference effects, it is necessary that the chassis of each tone unit be grounded. When the tone unit is mounted in an IX-3, IX-11 or cradle-type frame, a good earth ground on the relay racks or other equipment on which the frame is installed is necessary. Station batteries or other power supplies with grounded negative or positive leads can be employed in place of regular INIVEN™ power supplies.

When individual tone transmitters are operated out of the frame, the transmitter chassis should be connected to the earth ground.

6. MAINTENANCE

This section contains corrective maintenance procedures that can be used in conjunction with the operation test and output level adjustment procedures in Section 5.

6.1 The module you have purchased has been thoroughly inspected and tested in accordance with our specifications. The module does not require preventive maintenance. However, it is recommended that signal levels be checked and adjusted every 6 months.

6.2 In-plant quality assurance procedures specify transmission levels that vary for "hardware" and "system" orders. Testing the modules, in either case, is over a transmission link simulating a telephone circuit (600 ohms impedance) with a loss of -25 dbm from origin to destination. The attenuation and frequency response of the circuit is due to a number of factors which cannot be duplicated at the factory. The factors include:

1. Distance between stations.
2. Diameter and length of wire used in transmission circuit.
3. Actual impedance of transmission circuit.
4. Inductance and capacitance of transmission circuit.

Any references to transmit levels in the manual is a factory setting and must be reset in the field in accordance with the output level adjustment procedures in paragraphs 5.3 and 5.4.

6.3 Quick-Check—Table 6-1 contains quick-check procedures designed to isolate trouble in the majority of cases. When use of these procedures fails to locate the cause of the malfunction, refer to Section 4 for detailed theory of operation and the referenced schematics as an aid in signal tracing.

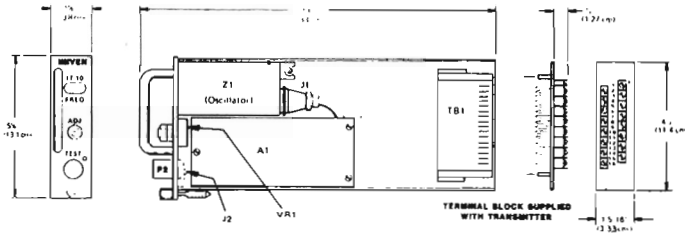
7. PARTS LIST

The following parts list is included to facilitate maintenance of the IT-10 AM tone transmitter. All parts are listed in the order of their reference designations, as applicable. Figure 3 contains a parts list for the major components of the transmitter. Figure 4 contains a parts list for printed circuit board A1.

7.1 IT-10 Transmitter Assembly (see Figure 3)

Table 6-1. Quick Check Malfunction Isolation

SYMPTOM	POSSIBLE CAUSE	REMEDY
SYSTEM CHECKS		
No operation.	Power failure of commercial power or IP power supply.	Check voltage.
Intermittent operation of some tone receivers.	Transmission circuit failure.	Call telephone company or responsible agency.
	Signal level shifted due to transmission circuit change.	Check all tone receivers to see if sensitivity has been affected. If so, notify responsible agency of change in circuit attenuation.
Tone receivers in "off" condition exhibit erratic and unsteady symptoms when checked using multimeter and Test Adapter.	Transmitter outputs set too high.	Check with telephone company or responsible agency for correct settings. For quick reference refer to Table 8-1.
	Telephone company circuit trouble.	Call telephone company and advise of problem.
	Grounded telephone company circuit or defective filter or oscillator.	Determine if ground is on telephone line or due to tone equipment by measuring each side of line to ground with line connected and then disconnected from equipment. If ground is on line, call telephone company. If ground is due to tone equipment, it may be caused by a defective oscillator or filter. Pull out each module in turn while monitoring ground with multimeter until absence of low resistance indication signifies module containing defective filter or oscillator.
IT-10 CHECKS		
No tone output.	Transmitter plug not in TEST socket.	Replace transmitter plug or jumper 1 to 9 and 2 of 8 of TEST socket.
	Defective fuse on circuit board.	Replace fuse. (Use jumper on fuse clip of ohmmeter not available to check fuse.)
	Q1 defective.	Replace transistor.
	Q5 defective.	Replace transistor.
Maximum output reduced (less than 1 Volt ac or +2 DBM).	IO-10 defective.	To determine if IO-10 is defective, exchange with another IO-10 of same or different frequency and check for output.
	Q2 or Q3 defective.	Replace one transistor at a time.



**Figure 3. IT-10 AM Transmitter—
Dimensions and Component Identification**

Table 8.1. Suggested Multiple Tone Transmitter Output Levels
When Information is not Available From Telephone Co.

Number of Tone Channels On Line	Recommended Levels	
	DBM	RMS Volts (600Ω)
1	0	0.78
2	-3	0.55
3	-5	0.45
4	-6	0.40
5	-7	0.35
6 to 7	-8	0.30
8 to 10	-10	0.25
12 to 16	-12	0.20
17 to 25	-13	0.17

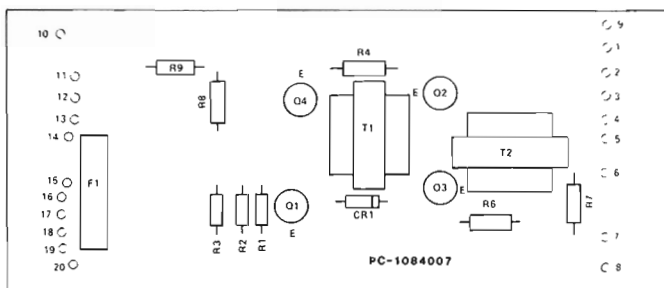
REF DESIG	DESCRIPTION	QTY	PART NUMBER	MFR
J1	IT-10 TRANSMITTER ASSY	1		INIVEN
	• CONNECTOR, Socket	1	401A2	Connector Corp.
	• BOOT, Socket	1	C-860W/OH	Methode
	• HANDLE	1	230-18AL832C	Promptus Elec.
	• FACEPLATE	1	06B1084-OIN	INIVEN
	• SCREW, Captive	1	08A1088-OIN	INIVEN
J2	• CONNECTOR, Socket	1	417A4	Connector Corp.
P2	• PLUG, Transmitter	1	P2	INIVEN
TB1	• CONNECTOR BOARD ASSY	1	CC1101-00	INIVEN
VR1	• RESISTOR, Variable, 250 ohm, 2W	1	0380C2-250Z	Clarostat
Z1	• OSCILLATOR ASSY	1	'10-10-XXXX	INIVEN
A1	• PRINTED CIRCUIT BOARD ASSY (See Figure 4 for breakdown)	1	AB1084-OIN	INIVEN

*For complete ordering number substitute frequency for XXXX.

7.2 Printed Circuit Board Assembly A-1 (See Figure 4)

Figure 4. Printed Circuit Board Assembly A1

REF DESIG	DESCRIPTION	QTY	PART NUMBER	MFR
CR1	PRINTED CIRCUIT BOARD ASSY A1	1		
	• DIODE	1	IN914	
F1	• FUSE	1	8AG-½AMP	
Q1-Q4	• TRANSISTOR	4	2N3645 (T0105 Pkg)	Internat'l Devices
	• SOCKET, Transistor	4	3-LPS-B	Cinch
R1	• RESISTOR, 1K, ¼W, 5%	1	RCF07J102	
R2	• RESISTOR, 12K, ¼W, 5%	1	RCF07J123	
R3	• RESISTOR, 240 ohm, ½W, 5%	1	RCF07J241	
R4	• RESISTOR, 80 ohm, ½W, 5%	1	RCF20J820	
R6	• RESISTOR, 3.3K, ½W, 5%	1	RCF20J332	
R7	• RESISTOR, 560 ohm, ½W, 5%	1	RCF20J561	
R8	• RESISTOR, 4.7K, ½W, 5%	1	RCF20J472	
R9	• RESISTOR, 470 ohm, ½W, 5%	1	RCF20J471	
T1	• TRANSFORMER	1	CC1070-00	INIVEN
T2	• TRANSFORMER	1	CC1019-00	INIVEN



CHANNEL CENTER FREQUENCY (Hz)

Channel Spacing (Hz)	CHANNEL CENTER FREQUENCY (Hz)					
	75	100	120	170	240	340
Baud Rate	50	50	60	80	120	170
-01	365	365	420	425	480	850
-02	440	465	540	595	720	1190
-03	515	565	660	765	960	1530
-04	590	665	780	935	1200	1870
-05	665	765	900	1105	1440	2210
-06	740	865	1020	1275	1680	2550
-07	815	965	1140	1445	1920	2890
-08	890	1075	1260	1615	2160	3230
-09	965	1175	1380	1785	2400	
-10	1040	1275	1500	1955	2650	
-11	1115	1375	1620	2125	2880	
-12	1190	1475	1740	2295	3120	
-13	1275	1575	1860	2465	3360	
-14	1350	1675	1980	2635		
-15	1425	1775	2100	2865		
-16	1500	1875	2220	2975		
-17	1575	2000	2340	3145		
-18	1650	2100	2460	3315		
-19	1725	2200	2580	3485		
-20	1800	2300	2700			
-21	1875	2400	2820			
-22	1950	2500	2940			
-23	2025	2600	3060			
-24	2100	2700	3180			
-25	2175	2800	3300			
-26	2250	2900	3420			
-27	2325	3000				
-28	2400	3100				
-29	2475	3200				
-30	2550	3300				
-31	2625	3400				
-32	2700	3500				
-33	2775					
-34	2850					
-35	2925					
-36	3000					
-37	3075					
-38	3150					
-39	3225					
-40	3300					
-41	3375					
-42	3450					

8. ORDERING INFORMATION

8.1 Please specify Model Number—Carrier Frequency, i.e. IT-10-1775 would specify a Model IT-10 transmitting at the carrier frequency of 1775 HZ.

8.2 Refer to Table 8-2 for a complete list of available frequencies.