

**T1/ E1 <-> STM-1
Multiplexer / Demultiplexer**

Model INT-9691

26 July 2010

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INTRONICS, INC.

MODEL INT-9691

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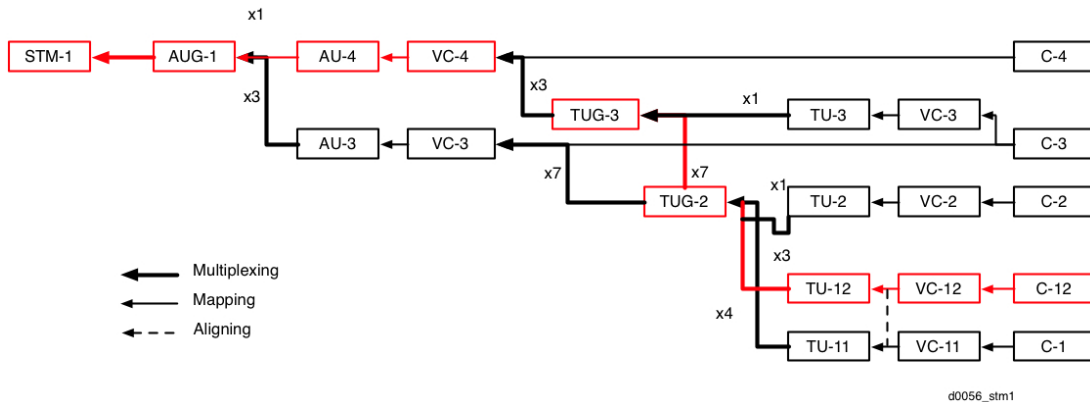
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1.0 Overview

The INT-9691 is a T1 / E1 <-> STM-1 multiplexer / demultiplexer in a single 1U rack-mountable unit. In T1 mode the multiplexer combines 84 T1 inputs into a single STM-1 primary rate OC-3 optical signal (155.52 mbps). In E1 mode the multiplexer combines 63 E1 inputs into a single STM-1 primary rate OC-3 optical signal (155.52 mbps). The T1 / E1 inputs may be configured to operate in “monitor mode”. In this mode the user may connect to existing T1 / E1 point-to-point interconnections without interfering with the signal, and monitor the signal without degrading it. In monitor mode the INT-9691 provides 20 dB of isolation from the existing T1 / E1 signal, and then provides 20 dB or more of linear amplification in its input line interface receivers to restore it prior to processing. The demultiplexer performs the reverse of the multiplexer, accepting a STM-1 optical input and extracting 84 T1 or 63 E1 outputs. The selection of T1 or E1 operational mode is a factory installed option.

The STM-1 format is VC-12 multiplexed with channelized E1 as shown in red below:



STM-1 Multiplex

The STM-1 format is VC-11 multiplexed with channelized T1 as shown above. It differs from E1 by replacing the three blocks in red at the lower right with the three black blocks below them. In T1 mode four TU-11's are multiplexed into each TUG-2 instead of three TU-12's as in E1 mode.

Other mapping configurations are available per special customer request.

2.0 Multiplexer / Demultiplexer Operation

The multiplexer accepts either 84 T1 or 63 E1 inputs via five rear panel female DB-78 connectors. The demultiplexer outputs either 84 T1 or 63 E1 signals via these same connectors. The pin assignments for these connectors are shown below.

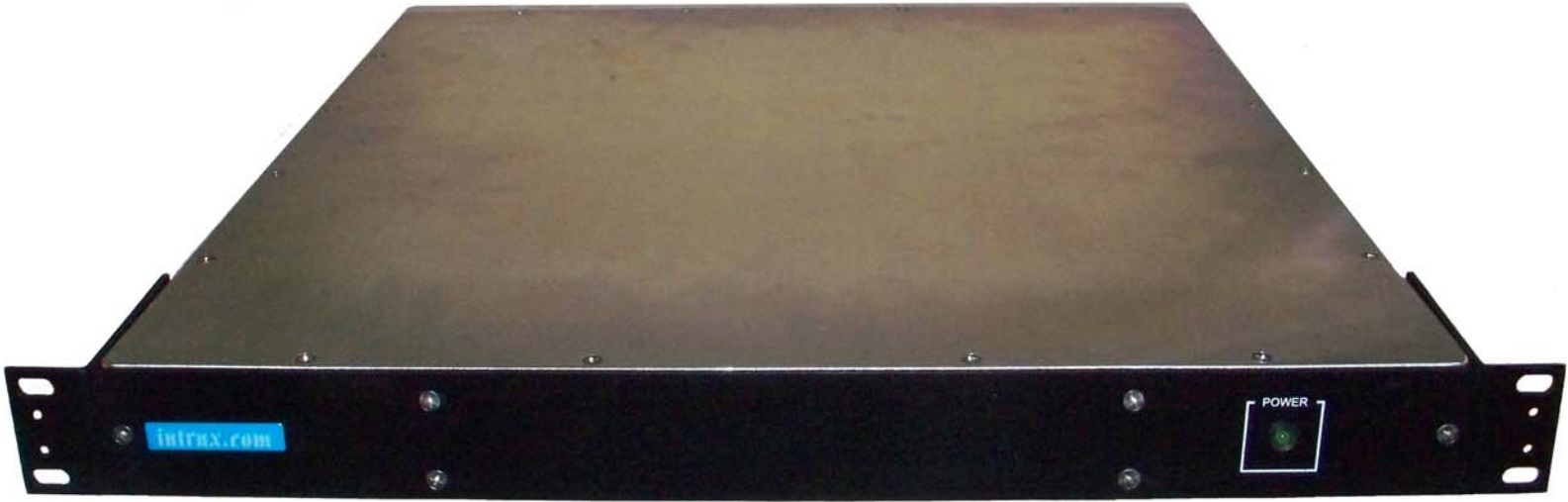
The user may select one of two factory installed T1 / E1 input line termination options. The first for T1 is 100 Ohm balanced termination or for E1 is 120 Ohm balanced. The second is monitor mode termination. The first option should be selected when the

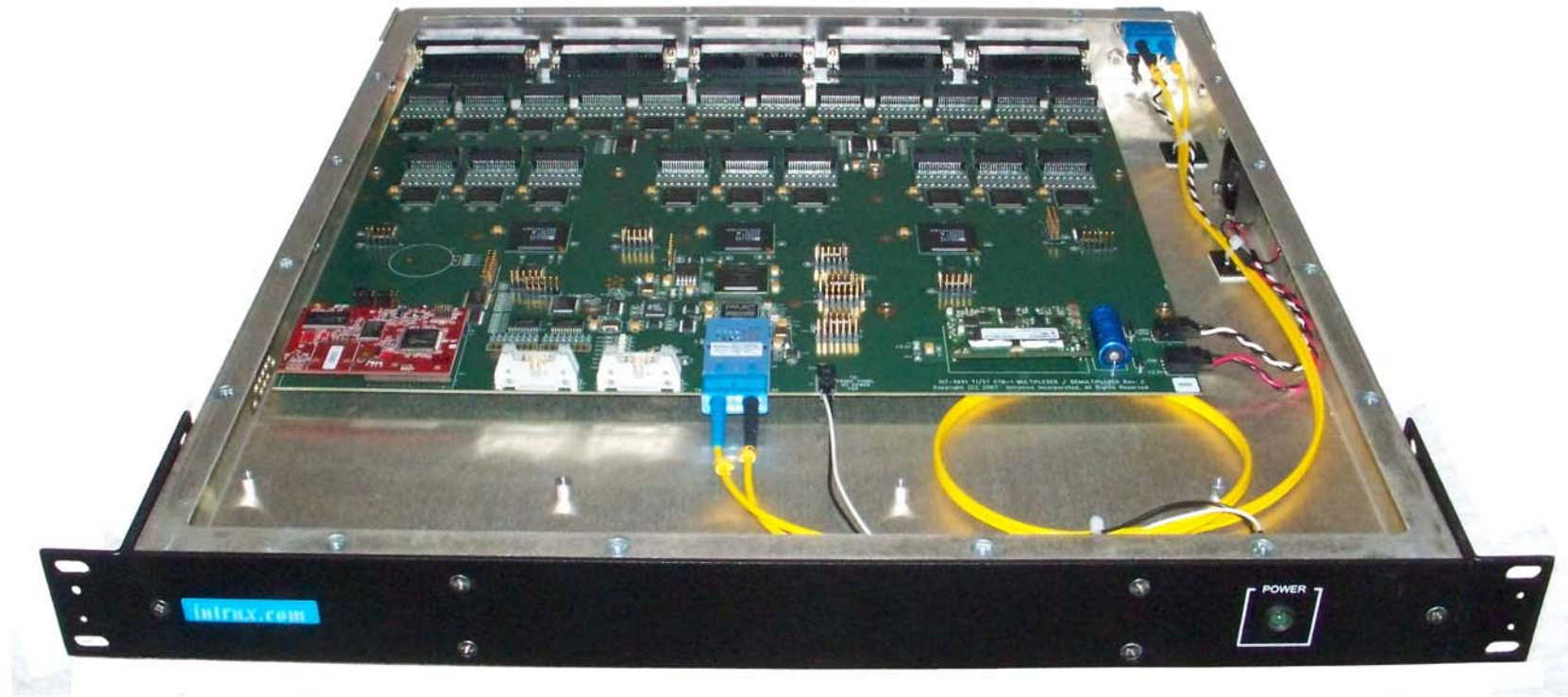
multiplexer is the primary receiving unit for the T1 / E1 inputs. When the multiplexer is not the primary T1 / E1 line receiving unit, but is attached to T1 / E1 lines terminated elsewhere, then monitor mode should be selected. Monitor mode adds 20 dB of isolation between the T1 / E1 lines and the multiplexer inputs to prevent the multiplexer from interfering with the T1 / E1 signals.

The unit may operate in a completely stand-alone environment with all operational mode selections made via internal user selectable jumper settings. Alternatively an optional 10/100 Base-T Ethernet interface is available for integration into the customer's command and status network.

DC power is applied to the unit via a rear panel barrier terminal strip. The required DC voltage is -48V nominal telco standard. Other power options are available

Front, internal and rear panel photos are shown on the following pages.







T1 IN Tip Pin #	T1 IN Ring Pin #	T1 OUT Tip Pin #	T1 OUT Ring Pin #		TUG-3	TUG-2	TU-11	CONN
1	21	40	60		1	1	1	J1
2	22	41	61		1	2	1	J1
3	23	42	62		1	3	1	J1
4	24	43	63		1	4	1	J1
5	25	44	64		1	5	1	J1
6	26	45	65		1	6	1	J1
7	27	46	66		1	7	1	J1
8	28	47	67		1	1	2	J1
9	29	48	68		1	2	2	J1
10	30	49	69		1	3	2	J1
11	31	50	70		1	4	2	J1
12	32	51	71		1	5	2	J1
13	33	52	72		1	6	2	J1
14	34	53	73		1	7	2	J1
15	35	54	74		1	1	3	J1
16	36	55	75		1	2	3	J1
17	37	56	76		1	3	3	J1
18	38	57	77		1	4	3	J1
19	39	58	78		1	5	3	J1
20		59		GND				J1

T1 IN Tip Pin #	T1 IN Ring Pin #	T1 OUT Tip Pin #	T1 OUT Ring Pin #		TUG-3	TUG-2	TU-11	CONN
1	21	40	60					J2
2	22	41	61		1	6	3	J2
3	23	42	62		1	7	3	J2
4	24	43	63		1	1	4	J2
5	25	44	64		1	2	4	J2
6	26	45	65		1	3	4	J2
7	27	46	66		1	4	4	J2
8	28	47	67		1	5	4	J2
9	29	48	68		1	6	4	J2
10	30	49	69		1	7	4	J2
11	31	50	70		2	1	1	J2
12	32	51	71		2	2	1	J2
13	33	52	72		2	3	1	J2
14	34	53	73		2	4	1	J2
15	35	54	74		2	5	1	J2
16	36	55	75		2	6	1	J2
17	37	56	76		2	7	1	J2
18	38	57	77		2	1	2	J2
19	39	58	78		2	2	2	J2
20		59		GND				J2

1	21	40	60		2	3	2	J3
2	22	41	61		2	4	2	J3
3	23	42	62		2	5	2	J3
4	24	43	63		2	6	2	J3
5	25	44	64		2	7	2	J3
6	26	45	65		2	1	3	J3
7	27	46	66		2	2	3	J3
8	28	47	67		2	3	3	J3
9	29	48	68		2	4	3	J3
10	30	49	69		2	5	3	J3
11	31	50	70		2	6	3	J3
12	32	51	71		2	7	3	J3
13	33	52	72		2	1	4	J3
14	34	53	73		2	2	4	J3
15	35	54	74		2	3	4	J3
16	36	55	75		2	4	4	J3
17	37	56	76		2	5	4	J3
18	38	57	77		2	6	4	J3
19	39	58	78		2	7	4	J3
20		59		GND				J3

1	21	40	60		3	1	1	J4
2	22	41	61		3	2	1	J4
3	23	42	62		3	3	1	J4
4	24	43	63		3	4	1	J4
5	25	44	64		3	5	1	J4
6	26	45	65		3	6	1	J4
7	27	46	66		3	7	1	J4
8	28	47	67		3	1	2	J4
9	29	48	68		3	2	2	J4
10	30	49	69		3	3	2	J4
11	31	50	70		3	4	2	J4
12	32	51	71		3	5	2	J4
13	33	52	72		3	6	2	J4
14	34	53	73		3	7	2	J4
15	35	54	74		3	1	3	J4
16	36	55	75		3	2	3	J4
17	37	56	76		3	3	3	J4
18	38	57	77		3	4	3	J4
19	39	58	78		3	5	3	J4
20		59		GND				J4

1	21	40	60		3	6	3	J5
2	22	41	61		3	7	3	J5
3	23	42	62		3	1	4	J5
4	24	43	63		3	2	4	J5
5	25	44	64		3	3	4	J5
6	26	45	65		3	4	4	J5
7	27	46	66		3	5	4	J5
8	28	47	67		3	6	4	J5
9	29	48	68		3	7	4	J5
10	30	49	69	X				J5
11	31	50	70	X				J5
12	32	51	71	X				J5
13	33	52	72	X				J5
14	34	53	73	X				J5
15	35	54	74	X				J5
16	36	55	75	X				J5
17	37	56	76	X				J5
18	38	57	77	X				J5
19	39	58	78	X				J5
20		59		GND				J5

E1 IN Tip Pin #	E1 IN Ring Pin #	E1 OUT Tip Pin #	E1 OUT Ring Pin #		TUG-3	TUG-2	TU-12	CONN
1	21	40	60		1	1	1	J1
2	22	41	61		1	2	1	J1
3	23	42	62		1	3	1	J1
4	24	43	63	X				J1
5	25	44	64		1	4	1	J1
6	26	45	65		1	5	1	J1
7	27	46	66		1	6	1	J1
8	28	47	67	X				J1
9	29	48	68		1	7	1	J1
10	30	49	69		1	1	2	J1
11	31	50	70		1	2	2	J1
12	32	51	71	X				J1
13	33	52	72		1	3	2	J1
14	34	53	73		1	4	2	J1
15	35	54	74		1	5	2	J1
16	36	55	75	X				J1
17	37	56	76		1	6	2	J1
18	38	57	77		1	7	2	J1
19	39	58	78		1	1	3	J1
20		59		GND				J1

E1 IN Tip Pin #	E1 IN Ring Pin #	E1 OUT Tip Pin #	E1 OUT Ring Pin #		TUG-3	TUG-2	TU-12	CONN
1	21	40	60	X				J2
2	22	41	61		1	2	3	J2
3	23	42	62		1	3	3	J2
4	24	43	63		1	4	3	J2
5	25	44	64	X				J2
6	26	45	65		1	5	3	J2
7	27	46	66		1	6	3	J2
8	28	47	67		1	7	3	J2
9	29	48	68	X				J2
10	30	49	69	X				J2
11	31	50	70		2	1	1	J2
12	32	51	71		2	2	1	J2
13	33	52	72		2	3	1	J2
14	34	53	73	X				J2
15	35	54	74		2	4	1	J2
16	36	55	75		2	5	1	J2
17	37	56	76		2	6	1	J2
18	38	57	77	X				J2
19	39	58	78		2	7	1	J2
20		59		GND				J2

1	21	40	60		2	1	2	J3
2	22	41	61		2	2	2	J3
3	23	42	62	X				J3
4	24	43	63		2	3	2	J3
5	25	44	64		2	4	2	J3
6	26	45	65		2	5	2	J3
7	27	46	66	X				J3
8	28	47	67		2	6	2	J3
9	29	48	68		2	7	2	J3
10	30	49	69		2	1	3	J3
11	31	50	70	X				J3
12	32	51	71		2	2	3	J3
13	33	52	72		2	3	3	J3
14	34	53	73		2	4	3	J3
15	35	54	74	X				J3
16	36	55	75		2	5	3	J3
17	37	56	76		2	6	3	J3
18	38	57	77		2	7	3	J3
19	39	58	78	X				J3
20		59		GND				J3

1	21	40	60		3	1	1	J4
2	22	41	61		3	2	1	J4
3	23	42	62		3	3	1	J4
4	24	43	63	X				J4
5	25	44	64		3	4	1	J4
6	26	45	65		3	5	1	J4
7	27	46	66		3	6	1	J4
8	28	47	67	X				J4
9	29	48	68		3	7	1	J4
10	30	49	69		3	1	2	J4
11	31	50	70		3	2	2	J4
12	32	51	71	X				J4
13	33	52	72		3	3	2	J4
14	34	53	73		3	4	2	J4
15	35	54	74		3	5	2	J4
16	36	55	75	X				J4
17	37	56	76		3	6	2	J4
18	38	57	77		3	7	2	J4
19	39	58	78		3	1	3	J4
20		59		GND				J4

1	21	40	60	X				J5
2	22	41	61		3	2	3	J5
3	23	42	62		3	3	3	J5
4	24	43	63		3	4	3	J5
5	25	44	64	X				J5
6	26	45	65		3	5	3	J5
7	27	46	66		3	6	3	J5
8	28	47	67		3	7	3	J5
9	29	48	68	X				J5
10	30	49	69	X				J5
11	31	50	70	X				J5
12	32	51	71	X				J5
13	33	52	72	X				J5
14	34	53	73	X				J5
15	35	54	74	X				J5
16	36	55	75	X				J5
17	37	56	76	X				J5
18	38	57	77	X				J5
19	39	58	78	X				J5
20		59		GND				J5

3.0 *Hardware Elements*

The INT-9691 is comprised of one 10" x 12" multi-layer printed circuit cards enclosed in a full wide 1 3/4" high rack mounted chassis. The front panel assembly includes a DC power status indicator LED. When illuminated the power supply within the unit is operating properly.

3.1 *Internal Configuration Options*

The INT-9691 printed circuit board provides for several jumper selectable options as described below. It is unlikely a user would find a need to alter the factory settings. However, if the E1 inputs have exceptionally high or low level amplitudes the user may find it necessary to adjust these settings.

Internal jumper JP14 on the PCB is read by the CPU at power on and selects various operating modes. The numbering of the jumpers as viewed from the top side with the front edge of the PCB nearest you is:

2	4	6	8	10	12	14	16
1	3	5	7	9	11	13	15

Operating Mode Selections:

Jumper 1-2 (Line Interface Unit Receiver Sensitivity)

Installed -	Receive sensitivity -43dB (long haul)
Removed -	Receive sensitivity -12dB (short haul)

Jumpers 3-4, 5-6 (Linear Gain)

3-4	5-6	
Installed	Installed	Linear gain = 0 dB
Removed	Installed	Linear gain = 20 dB
Installed	Removed	Linear gain = 26 dB
Removed	Removed	Linear gain = 32 dB

Jumper 6-7, 8-9 (Payload Xmit Reference Frequency)

7-8	9-10	
Installed	Installed	Reference Frequency – T1/E1 Input 1 Recovered Clock
Removed	Installed	Reference Frequency - SDH Line Clk (see below)
Installed	Removed	Reference Frequency - External Input (not implemented)
Removed	Removed	Illegal

Jumper 11-12 (SDH Line Clock - see above)

Installed - SDH Line Clk = SDH Transmit Clock
Removed - SDH Line Clk = Recovered SDH Receive Clock (requires optical input)

The factory defaults are:

Installed 5-6, 9-10, 11-12

Receive sensitivity -12dB (short haul)
Linear gain = 20 dB
Reference Frequency - SDH Line Clk
SDH Line Clk = SDH Transmit Clock

Spare jumpers are included within the unit on jumper posts 1 and 3, but not installed across 1-2 or 3-4.

At power on the unit tests to see if an optical input is present. If so then it is presented to the demultiplexer side for processing. If not (typical for multiplexer only application) the multiplexer output is looped back into the demultiplexer side.

3.2 Preventive Maintenance

No preventive maintenance, periodic alignments or adjustments are required.

4.0 *Specifications*

T1 / E1 In / Out

T1 - ANSI, T1.403, 1.544 Mbps
Number of inputs and outputs - 84
Line Code AMI, B8ZS, balanced (tip & ring)
Termination 100 Ohms or Monitor Mode (inputs)
Framed or Unframed

E1 - ITU / CEPT, G.703, 2.048 Mbps
Number of inputs and outputs - 63
Line Code AMI, HDB3, balanced (tip & ring)
Termination 120 Ohms or Monitor Mode (inputs)
Framed or Unframed

STM-1 In / Out

Number of inputs and outputs - 1
Single mode, 1300 nm, OC-3, 155.52 Mbps
Connector type SC (in and out)
SDH Digital Hierarchy

Remote Control (optional)

Ethernet 10/100 BaseT
Telnet protocol, others available

D/C Power

-18 to -75 VDC, (-48 VDC nominal)
15 Watts

Physical

1.75" H, 17" W, 18" D (not incl cable support bar)
1U Rack Mount
5 lbs.

Operating Temperature

0 – 50C, non-condensing

MTBF

720,000 hrs (estimated)