

**TECHNICAL MANUAL
EXHIBIT II**

(PRELIMINARY)

ITS-5726 *CJJ 79XITS-
7031*

**WCS
DIGITAL
TRANSMITTER**

REV: 0

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ITS-5726
UPCONVERTER/AMPLIFIER

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ITS-5726

SYSTEM DESCRIPTION

The ITS-5726 is a digital transmitter capable of operating as a television transmitter at a nominal power of 50 watts average. The ITS-5726 is comprised of a modulator assembly (SAT Division Telecommunications PQM 2100), an upconverter/amplifier tray, and an amplifier tray. The ITS-5726 incorporates Automatic Level Control (ALC) to maintain a constant output power level.

Combining the latest in GaAs FET amplifier technology and Feed Forward distortion cancellation, the ITS-5724 delivers an output power of 50 watts (average).

The unit's circuitry is enclosed in a tray assembly designed for mounting in a standard 19" equipment rack. The unit comes complete with slide rail mounting hardware to allow the tray to move in and out of the rack for ease of service.

The ITS-5726 is factory calibrated for a front panel LCD display power meter reading of 100%, which represents the rated output power of the unit (unless otherwise specified).

SPECIFICATIONS

Technical Specifications:

Type of Emissions 6M00D7W
Frequency Range 2305 to 2320 and 2345 to 2360 MHz (four 6 MHz channels)
Output Power Rating 50 watts average
DC voltage and total current of final amplifier stage 10 volts DC at 65 amps
(Class A - Not RF power dependent)

Performance Specifications:

Operating Frequency Range 2305 to 2320 and 2345 to 2360 MHz
RF output - Nominal:
 Power 50 watts average
 Impedance 50 ohms
 Connector Type N

Input (Modulator) QAM, MPEG-2 Transport Stream
 Impedance: 75Ω (BNC)

Out-of-Band Power:
 2320-2345 MHz $80 + 10 \text{ Log}(50\text{W})\text{dB} = 97\text{dB max}$
 below 2300 and above 2370 MHz $70 + 10 \text{ Log}(50\text{W})\text{dB} = 87\text{dB max}$
 2300-2320 MHz and 2345-2370 MHz $43 + 10 \text{ Log}(50\text{W})\text{dB} = 60\text{dB max}$

Electrical Requirements

Power Line Voltage:
 Modulator 90 to 132 VAC, 47 to 63 Hz
 Upconverter 117/220 VAC $\pm 10\%$, 50 or 60 Hz
 Amplifier 208/240 VAC $\pm 10\%$, 50 or 60 Hz

Power Consumption:
 Modulator 55 watts
 Upconverter 380 watts
 Amplifier 1243 watts

Environmental

Maximum Altitude:
 Modulator 10,000 feet (3,050m)
 Upconverter 12,000 feet (3,660m)
 Amplifier 12,000 feet (3,660m)

Ambient Temperature
 Modulator +5° to +45°C
 Upconverter 0° to +50°C
 Amplifier 0° to +50°C

SPECIFICATIONS - continued

Mechanical

Dimensions: (WxDxH)

Modulator.....	16.9" x 17.7"x 1.73" (43.0cm x 45.0cm x 4.4cm)
Upconverter	19" x 21" x 8.75" (48.3cm x 53.3cm x 22.24cm)
Amplifier	19" x 30" x 10.25" (48.3cm x 76.2cm x 26.0cm)

Weight:

Modulator.....	11 lbs. (5.0 kgs)
Upconverter	47 lbs. (21.3 kgs)
Amplifier	125 lbs. (56.7 kgs)

FRONT PANEL LCD DISPLAY/KEYPAD DESCRIPTION:

Main Screens

1. (splash screen for 3 seconds on power up)

ADC ITS CORPORATION (LOGO)

2. (When the transmitter is in operate, the STB standby menu appears; when the transmitter is in standby the OPR operate menu appears.)

MODEL: 5724

RF CHANNEL: A1

STB STS PRV NXT

- 3.

VERSION: 1.0

SCADA ADDRESS: 32

STB STS PRV NXT

- 4.

OUTPUT PWR: 75%



0 50

100

STB STS PRV NXT

5. (display only if external amp present)

EXT OUTPUT PWR: 75%



0 50

100

STB STS PRV NXT

- 6.

REFLECTED PWR: 10%



0 50

100

STB STS PRV NXT

7. (display only if external amp present)

EXT REFLECTED PWR: 10%			
0	50		
100			
STB	STS	PRV	NXT

Status Screens

1.

TRANSMITTER STATUS			
ALC VOLTAGE: 6.7 V			
STB	SYS	PRV	NXT

2.

TRANSMITTER STATUS			
AFC VOLTAGE: 4.1 V			
STB	SYS	PRV	NXT

NOTE: TEXT FLASHES ON DISCRETE INPUT FAULT CONDITION FOR ALL SCREENS THAT DISPLAY A FAULT CONDITION. THE MOST RECENT FAULT SCREEN IS AUTOMATICALLY DISPLAYED.

3.

TRANSMITTER STATUS			
IF PRESENT			
STB	SYS	PRV	NXT

or

TRANSMITTER STATUS			
IF INPUT FAULT			
STB	SYS	PRV	NXT

In the transmitter status screen/menu, the second line will display the fault status of a particular item. A list of the items showing the normal and the fault condition is given below:

Second Line Information

Normal

IF PRESENT
 OUTPUT POWER OK
 PLL LOCKED
 EXT REF PRESENT
 AMP MODULE OK
 TEMP OK
 PWR SUPPLY OK
 PEAK VS AVG OK

Fault (flashing)

IF INPUT FAULT
 OUTPUT POWER FAULT
 PLL FAULT
 EXT REF FAULT
 AMP MODULE FAULT
 TEMP FAULT
 PWR SUPPLY FAULT
 PEAK VS AVG FAULT

(if an external amp is present)

EXT AMP MODULE OK	EXT AMP MODULE FAULT
EXT AMP TEMP OK	EXT AMP TEMP FAULT
EXT PWR SUPPLY OK	EXT PWR SUPPLY FAULT

(if a modulator is present)

MODULATR VIDEO PRSNT	MODULATR VIDEO LOSS
MODULATR PLL LOCKED	MODULATR PLL FAULT
MODULATR INPUT OK	MODULATR INPUT FAULT

Setup Screens

NOTE: THE PARAMETER THAT IS TO BE SELECTED WILL BE FLASHING.

1. (MODEL SELECTIONS: 5722, 5723, 5724, 5725, 5726, 5727)

MODEL SETUP					
MODEL: 5524					
↑	↓	SEL	PRV	NXT	

2.

RF CHANNEL SETUP					
RF CHANNEL: A1					
↑	↓	SEL	PRV	NXT	

3.

SCADA ADDRESS SETUP					
SCADA ADDRESS: 32					
↑	↓	SEL	PRV	NXT	

4.

FWD PWR FLT SETPOINT					
POWER = 28 %					
↑	↓	SEL	PRV	NXT	

ITS-5722
TRANSMITTER

DRAWING LIST
UPCONVERTER/AMPLIFIER TRAY

The UPCONVERTER/AMPLIFIER TRAY consist of the following boards/modules:

Power Supply Module	1585-5110
Interconnect	1585-8110
Transmitter Control Monitoring Module	1585-1130
Schematic	1585-3130
80 Watt PEP Power Amplifier Module	1585-1136
Block Diagram	1585-3136
Schematic	1585-8136

The 480 Watt PEP Amplifier Module consist of the following boards/modules:

40 Watt PEP Power Amplifier Board	1585-1196
Schematic	1585-3196
Dual Power Detector Board	1585-1125
Schematic	1585-3125
3 Section Bias Protection Board	1585-1250
Schematic	1585-3250
Amplifier Daughter Board (Right Side)	1585-1147
Schematic	1585-3147
Amplifier Daughter Board (Left Side)	1585-1148
Schematic	1585-3148

Local Oscillator/Upconverter Module	1585-1143
Interconnect	1585-8143

The Local Oscillator/Upconverter Module consist of the following boards:

Single Stage Amplifier Board	1585-1101
Schematic	1585-3101
Local Oscillator/Upconverter Board	1585-1117
Schematic	1585-3117

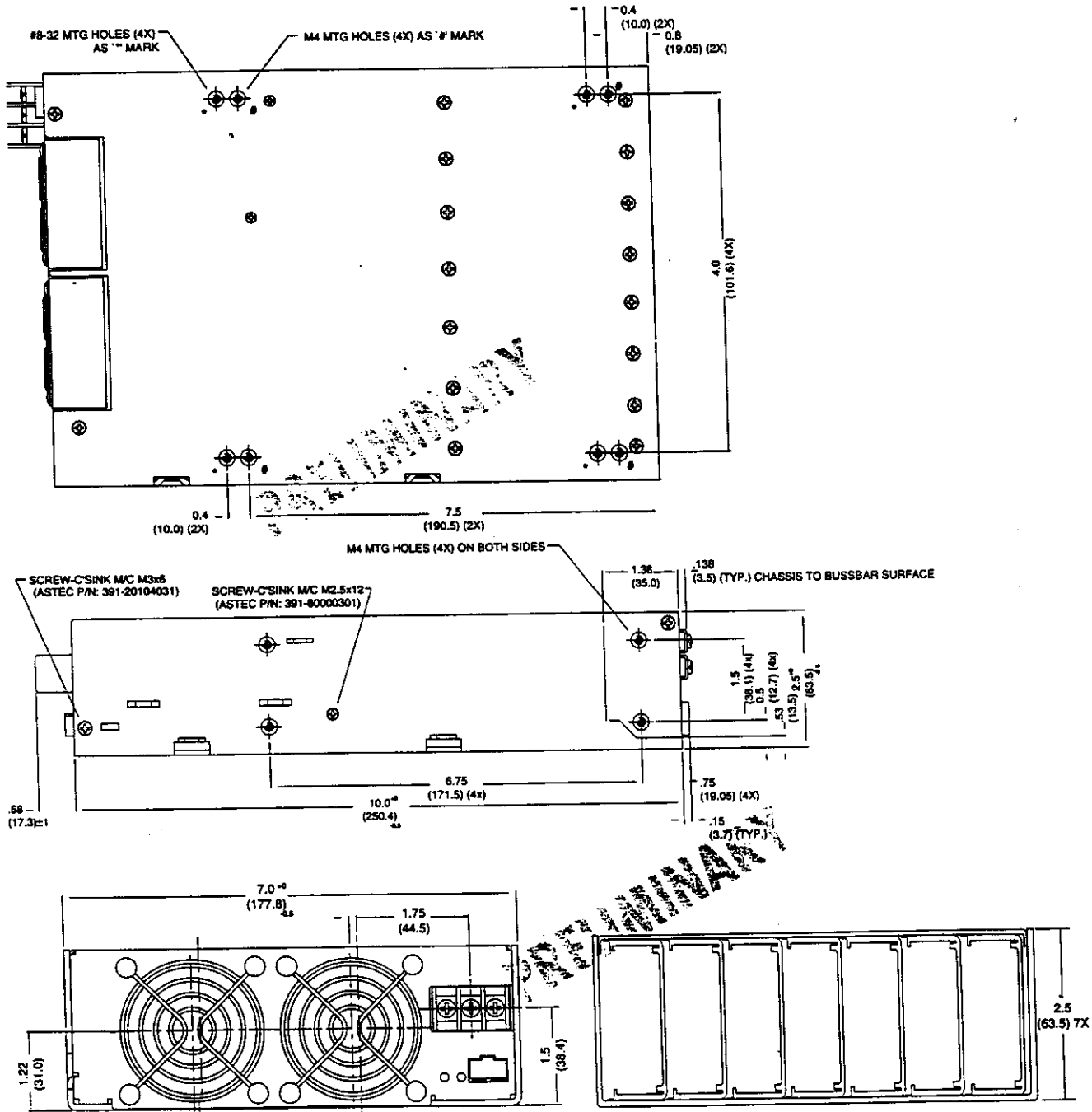
ITS-5722
TRANSMITTER

DRAWING LIST
UPCONVERTER/AMPLIFIER TRAY

IF Processing Module.....	1585-1198
Schematic	1585-3198

DRAWINGS • MVP PRISM MP8

7-inch Case Size 2.5" x 7" x 10



NOTES

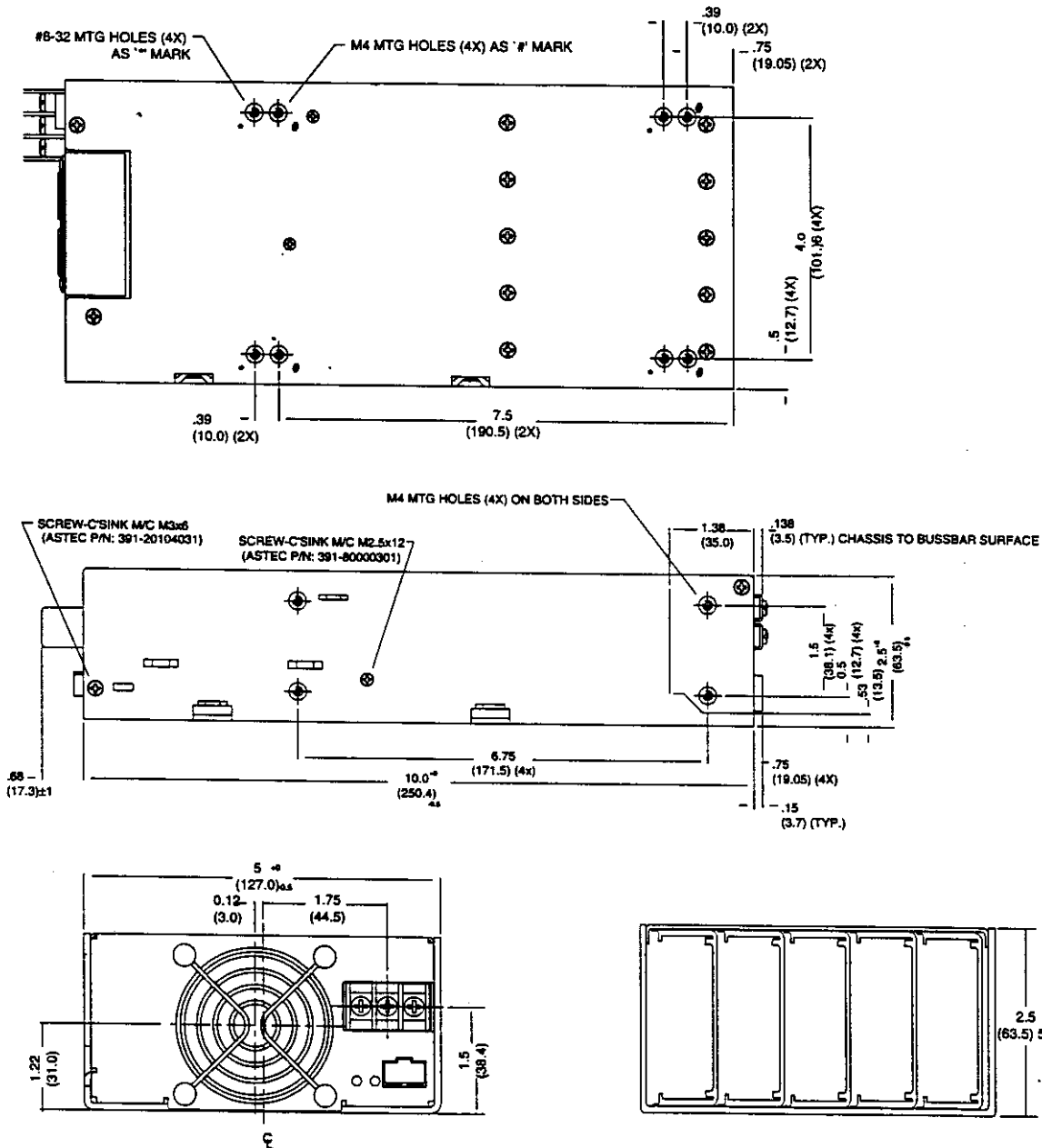
1. Input: Barrier type. Three No. 6-32 B.H. screws (0.375" centers).
2. Control connectors: (J1 and J2) 10 position Molex 90130-3210 housing, gold plated contacts. Mates with Molex 90153-0210 (IDT) housing, or 90142-0010 housing with 90119-2110 crimp contacts (Molex C - Grid III Series). Connector kit includes mating connector and 10 pins, Astec part #70-841-004.
3. Chassis material: aluminum with chemical film coating.
4. Bar code: code 39 extended.
5. All dimensions are in inches and (mm) and are typical.

MVP SERIES

400 - 800 WATTS

DRAWINGS • MVP PRISM MP4, MP6

5-inch Case Size 2.5" x 5" x 10" (11)



NOTES

1. Input: Barrier type. Three No. 6-32 B.H. screws (0.375" centers).
2. Control connectors: (J1 and J2) 10 position Molex 90130-3210 housing, gold plated contacts. Mates with Molex 90153-0210 (IDT) housing, or 90142-0010 housing with 90119-2110 crimp contacts (Molex C - Grid III Series). Connector kit includes mating connector and 10 pins, Astec part #70-841-004.
3. Chassis material: aluminum with chemical film coating.
4. Bar code: code 39 extended.
5. All dimensions are in inches and (mm) and are typical.

OUTPUT CURRENTS

Single Output 3-digit Code Selection Chart

Voltage Code	Voltage	Module Code		
		Takes up 1 Slot Current	Takes up 2 slots Current	Takes up 3 slots Current
A	2 V	35	60	120
B	2.2 V	35	60	120
C	3 V	35	60	120
D	3.3 V	35	60	120
E	5 V	35	60	120
F	5.2 V	35	60	115
G	5.5 V	34	58	109
H	6.0 V	23	42	78
I	8.0 V	20	36	68
J	10 V	18	32	60
K	11 V	17	31	54.5
L	12 V	17	30	50
M	14 V	12.5	21	40.5
N	15 V	14	20	39
O	18 V	11	19	33.3
P	20 V	10.5	18	30
Q	24 V	8.5	15	23.5
R	28 V	6.7	11	21.4
S	30 V	6.5	11	20
T	33 V	6.2	10.9	18.2
U	36 V	5.8	10	16.6
V	42 V	4.2	7.5	12.5
W	48 V	4.0	7.5	12.5
X	54 V	3.7	6.0	11
Y	60 V	3.5	6.0	10

Example: 5V @ 60A Module Code — **2 E** — Voltage Code

Dual Output 3-digit Code Selection Chart

Voltage Code	Voltage	Takes up 1 slot Current	
		V1	V2
A	2 V		10
B	2.2 V		10
C	3 V		10
D	3.3 V		10
E	5 V	10	10
F	5.2 V		10
G	5.5 V		10
H	6.0 V		10
L	12 V	10	4
M	14 V	9	4
N	15 V	8	4
Q	24 V	4	2
R	28 V	3	2

*Note: Total loading not to exceed 144 watts.

Example: 5V @ 10A; 12V @ 4A* Module Code (always 4) **4 E L**

Triple Output 3-digit Code Selection Chart

Voltage Code	Voltage	Takes up 1 slot Current		
		V1	V2	V3
A	2 V	-	-	2
B	2.2 V	-	-	2
C	3 V	-	-	2
D	3.3 V	-	-	2
E	5 V	-	-	2
F	5.2 V	-	-	2
G	5.5 V	-	-	2
H	6.0 V	-	-	2
I	8.0 V	1	1	1
J	10 V	1	1	1
K	11 V	1	1	1
L	12 V	1	1	1
M	14 V	1	1	1
N	15 V	1	1	1
O	18 V	1	1	1
P	20 V	-	0.5	0.5
Q	24 V	-	0.5	0.5
R	28 V	-	0.5	0.5

*Note: Total loading not to exceed 36 watts.

Example: 12V @ 1A; 20V @ 0.5A; 5V @ 2A* **No Module Code required

NOTES

Electrical Characteristics:

- DC OK minus 2 to 6% of nominal output voltage (tracking).
- Inhibit & Enable are both TTL compatible. ISOLATED requires 2-mA source, TYP.
- INPUT OK LED: Illuminated= Input OK.
- GLOBAL DC OK LED: Illuminated= Monitored outputs operating within tolerance.
- Specifications subject to change without notice.

INPUT ASSIGNMENTS

PFC Input

J1 CONTROL CONNECTOR

Pin No.	Function
1	INPUT OK - "Emitter"
2	INPUT OK + "Collector"
3	Global DC OK - "Emitter"
4	Global DC OK + "Collector"
5	Spare
6	Global Inhibit/Enable Logic "O"
7	Global Inhibit/Enable Logic "I"
8	Global Inhibit/Enable Return
9	SELV, 5V Housekeeping Bias
10	SELV, 5V Housekeeping Bias Return

Ten (10) position Molex 90130-3210 housing with select gold plated contacts.

DC Output Controls & Signals: Single/Dual Output modules

J1 CONTROL CONNECTOR

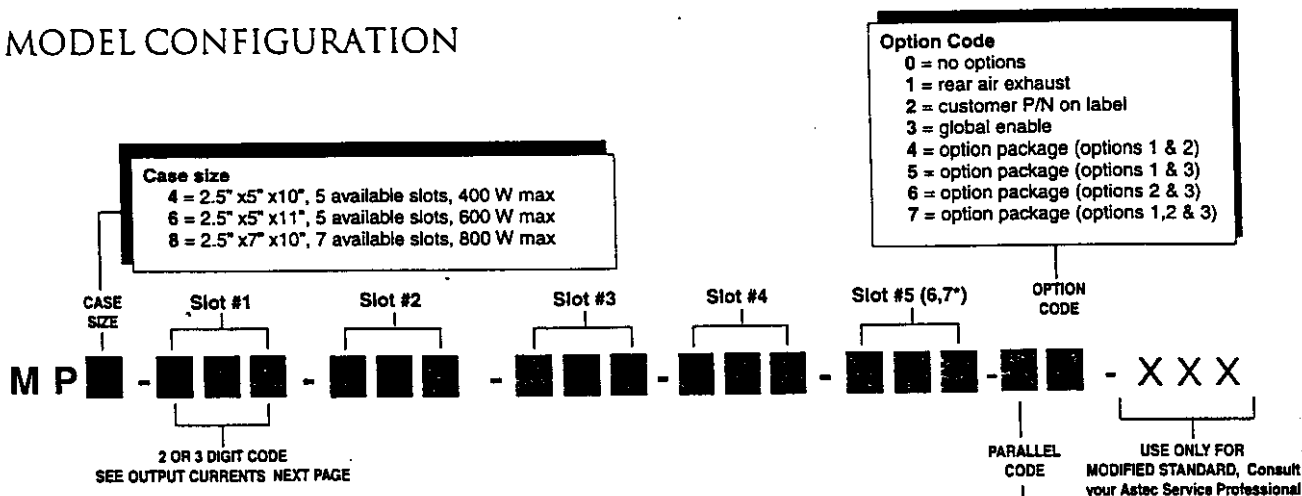
Pin No.	Function	
1 V1	+Remote Sense	single or dual o/p main
2 V1	Remote Margin / V. Program	single o/p
3 V1	Margin High	single o/p
4 V1	-Remote Sense / Margin Low	single or dual o/p main
5 V1	Spare	
6 V1	Module, Isolated Inhibit	single o/p
7 V1	Module Inhibit return	single o/p
8 V1	Current Share (SWP)	single or dual o/p main
9 V2	+ Remote Sense	dual o/p, single is spare
10 V2	- Remote Sense	dual o/p, single is spare

Ten (10) position Molex 90130-3210 housing with select gold plated contacts.

MVP SERIES

400 - 800 WATTS

MODEL CONFIGURATION



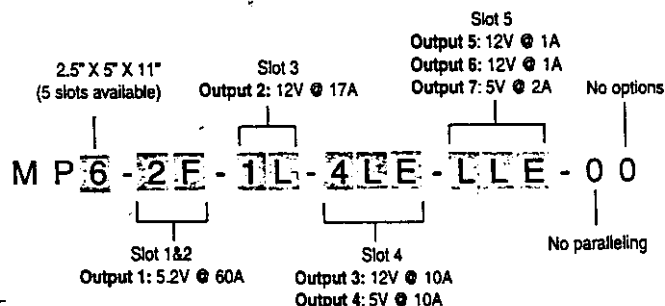
Notes:

- Omit digits that do not apply.
 - Specify modules from lowest number of outputs to highest. (Single/Dual/triple)
 - If number of outputs are equal, specify modules from highest to lowest power increments. If power increments are equal, specify highest to lowest output current.
 - Always start with SLOT 1.
 - All MVP model configurations created using this selection guide are standard MVP products with standard availability and lead times.
- Follow same modeling number convention for MP8 Slots 6&7.

MP4 & MP6 available slots		Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
MP8 available slots		Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
*Standard Parallel Codes		7	6	5	4	3	2	1
0 = no parallel		•	•	•	•	•	•	•
1 = 1 & 2		•	•	•	•	•	•	•
2 = 2 & 3		•	•	•	•	•	•	•
3 = 3 & 4		•	•	•	•	•	•	•
4 = 4 & 5		•	•	•	•	•	•	•
5 = 3 & 4 & 5		•	•	•	•	•	•	•
6 = 3 & 4 & 5 & 6		•	•	•	•	•	•	•
7 = 3 & 4 & 6 & 7		•	•	•	•	•	•	•

*For custom parallel configurations, contact your Astec Service Professional.

EXAMPLES



Examples of Model Numbers - SINGLE OUTPUTS			
Total Power	Volts/Amps	Size	Model Number
360 W	2 / 180	2.5 x 5 x 10	MP4-3A-2A-30
400 W	5 / 80	2.5 x 5 x 10	MP4-3E-00
400 W	2 / 200	2.5 x 7 x 11	MP8-3A-2A-1A-50
600 W	2 / 275	2.5 x 7 x 11	MP8-3A-3A-1A-70
600 W	5 / 120	2.5 x 5 x 11	MP6-3E-00
600 W	48 / 12.5	2.5 x 5 x 11	MP6-3W-00
800 W	5 / 160	2.5 x 5 x 10	MP8-3E-2E-30
800 W	48 / 16.6	2.5 x 7 x 10	MP8-3W-1W-30

Examples of Model Numbers - MULTIPLE OUTPUTS								
Total Power	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Size	Model Number
400 W	5 / 60	3.3 / 35	12 / 1	12 / 1	12 / 1		2.5 x 5 x 10	MP4-2E-1D-LLL-00
400 W	24 / 15	12 / 17	5 / 30				2.5 x 5 x 10	MP4-2Q-1L-1E-00
400 W	5 / 60	12 / 17	12 / 10	5 / 10			2.5 x 5 x 10	MP4-2E-1L-4LE-00
400 W	5 / 35	12 / 10	3.3 / 10	12 / 1			2.5 x 5 x 10	MP4-1E-4LD-LLE-00
600 W	5 / 60	3 / 60	12 / 10	12 / 4			2.5 x 5 x 11	MP6-2E-2C-4LL-00
600 W	6 / 60	5 / 35	24 / 8.5	24 / 4	12 / 4		2.5 x 5 x 11	MP6-2H-1E-1Q-4QL-00
600 W	5 / 120	12 / 17	12 / 10	5 / 10			2.5 x 5 x 11	MP6-3E-1L-4LE-00
600 W	12 / 30	5 / 35					2.5 x 5 x 11	MP6-2L-1E-00
800 W	36 / 16.6	24 / 4	5 / 10	12 / 10	12 / 4		2.5 x 7 x 10	MP8-3U-4QE-4LL-00
800 W	5 / 120	3.3 / 35	12 / 17	12 / 10	12 / 4		2.5 x 7 x 10	MP8-3E-1D-1L-4LL-00
800 W	15 / 20	5 / 35	15 / 14	24 / 8.5	15 / 8	5 / 10	2.5 x 7 x 10	MP8-2N-1E-1N-1Q-4NE-00
800 W	2 / 180	5 / 60					2.5 x 7 x 10	MP8-3A-2A-2E-30

ENVIRONMENTAL

Operating temperature: -20°C to 50°C (derate each output linearly to 50% at 70°C)

Shock/Vibration: Mil-Hdbk 810E

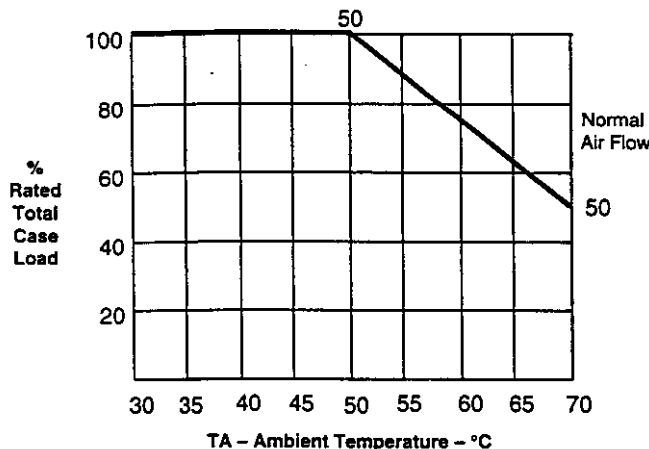
Humidity: 95% non-condensing

Storage temperature: -40°C to +85°C

Temperature coefficient: 0.02% per °C

Cooling: Internal DC fan (Field replaceable)

Power Derating Curve



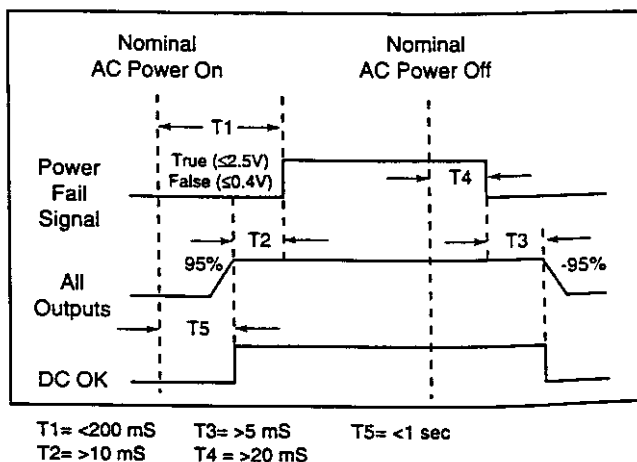
Input

Input voltage 85 to 264 VAC
 120 to 350 VDC
 Frequency 47 to 440 Hz
 Inrush current 40 A max
 Efficiency 70% - 80% @ full case load 115VAC
 Power factor 0.99 typical
 Turn-on time AC / 1 sec; Inhibit / 150 ms max
 EMI filter CISPR 22, EN55022 Curve B conducted/radiated
 Leakage current ... 0.3 mA max at 230 VAC
 Holdover storage ... 20 ms minimum/25 ms typical independent of VAC

AC OK

warning time > 5ms (power fail)
 Harmonic Distortion... Meets EN61000-3-2
 Isolation 3750 VDC Input to Output/Chassis
 Global Inhibit/Enable . TTL, Either Logic

Power On/Off Sequence



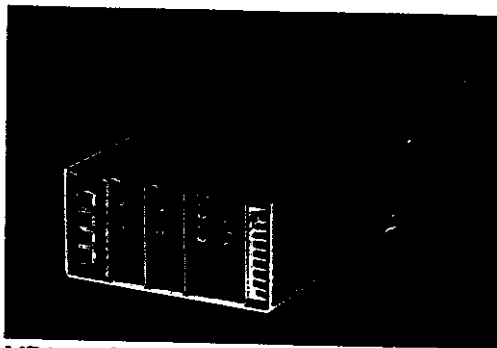
Output

Adjustment range ... $\pm 10\%$ minimum
 Margining $\pm 5\%$ nominal
 Overall reg 0.4% or 20 mV max (36W modules 4% max)
 Ripple RMS: 0.1% or 10 mV
 P-P: 1.0% or 50 mV
 Bandwidth limited to 20 MHz
 Dynamic response... <2% or 100 mV with 25% load step. <2% or 150 mV on dual output module
 Recovery time To within 1% in < 300 μ sec
 Overvoltage protection 2 to 5.5 V 122% to 134% of output voltage; 6 to 60 V 110% to 120%; recycle AC to reset
 Overload protection Single O/P modules: 105% to 120% of rated current
 Dual/Triple modules: Limited by total power
 Short circuit protection Protected for continuous short circuit, recovery automatic
 Reverse voltage protection 100% of rated output current
 Thermal protection .. All O/P's disabled when internal temp exceeds safe operating range. >5mSec warning
 Remote sense Up to 0.5 V total drop
 Single wire parallel .. Current share to within 2% of total rated current
 DC OK -2% to -6% of nominal of any monitored output
 Minimum load Not required on single output modules. 10% required on dual output modules
 Bias voltage 5VDC @250 mA max present whenever input is applied
 Module Inhibit TTL, isolated

1100000

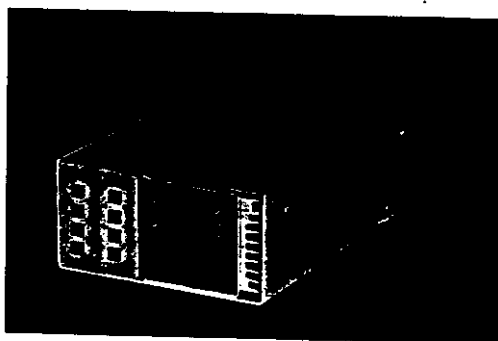
MVP SERIES

400 - 800 WATTS



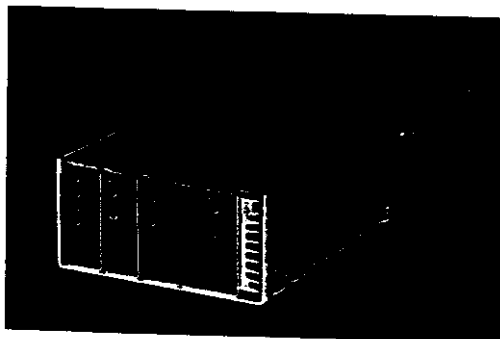
MP4 - 2Q - 1L - 1E - 00

..... 400W total



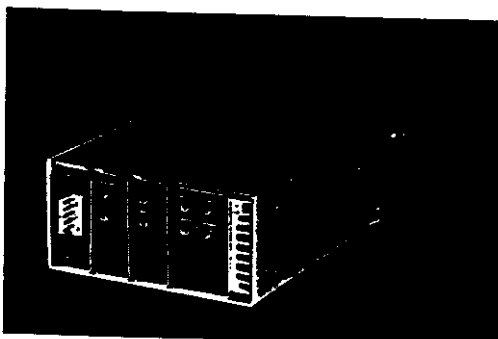
MP4 - 3Q - 00

..... 400W total



MP6 - 3E - 1L - 4LE - 00

..... 600W total



MP6 - 2N - 1E - 1N - LLE - 00

..... 600W total

MVP Series

400-800 Watts • 1 to 10 Outputs

MVP is a full-featured medium power modular product with a PFC front end as a standard input. It is available in both single and multiple output versions with over one million different output combinations as standard. Offering a very compact footprint, the 400 watt package measures 2.5" x 5" x 10", the 600 watt package measures 2.5" x 5" x 11", and the 800 watt package measures 2.5" x 7" x 10".

SPECIAL FEATURES

- Power factor correction
- IEC EN61000-3-2 harmonic distortion compliance
- CISPR 22, EN55022 Curve B conducted / radiated EMI
- IEC 801 immunity standards
- European CE Mark requirements
- Current share on all outputs with ratings of 10 Amps or greater
- Remote sense on all outputs with ratings greater than 2A
- Overload protection on all outputs
- Voltage adjustment on all outputs
- Margining on all single output modules
- Input OK signal and status indicator LED
- Global DC OK signal and status indicator LED
- Global and individual module inhibits/enable
- 1 year warranty
- Forced air cooling, field replaceable fan
- Isolated 5V bias voltage

SAFETY

UL	UL1950; UL2601 (non-patient connected)
CSA	CSA22.2 No. 234 Level 5
IEC	IEC950, Class 1
VDE	EN60950
BABT	Compliance to EN 60950, BS 7002
CB	Certificate and report
CE	Mark

ITS-5766
AMPLIFIER

DRAWING LIST

2-Way Combiner Module	2111-5008
2-Way Splitter Module	1586-5134
Power Detector/Control Board	1586-1118
Schematic	1586-3118
25 Watt Power Amplifier Assembly	1586-1117
Interconnect	1586-8117

The 25 Watt Amplifier Assembly consist of the following boards/modules:

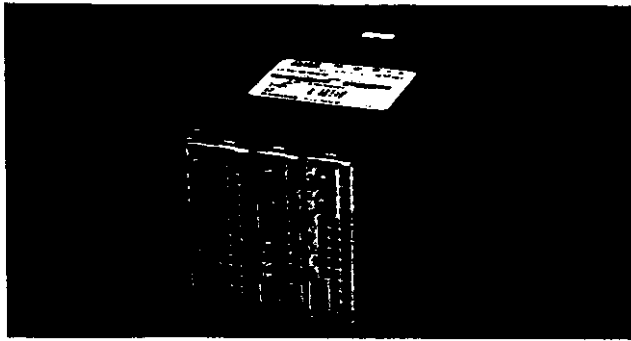
25 Watt Amplifier Module	1585-1266
Schematic	1585-3266
Amplifier Daughter Board	1512-1110
Schematic	1512-3110
8 Section Bias Protection Board	1586-1109
Schematic	1585-3109
DC to DC Converter Board	
Schematic	ITS-DT380-11

The Power Factor Corrected Front End Module consist of the following power supplies:

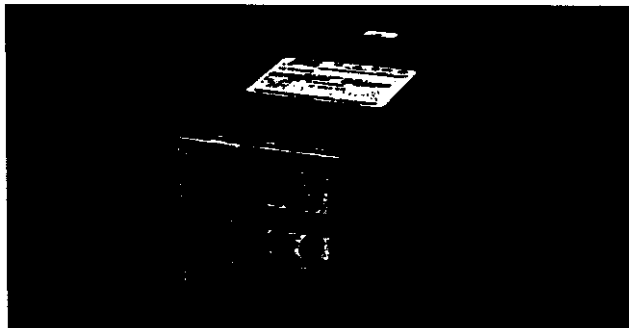
PFC 200W Supply	(VS3) 73-450-0001
40W Switching Supply	LPS23
80W Switching Supplu	LPS63

VS SERIES

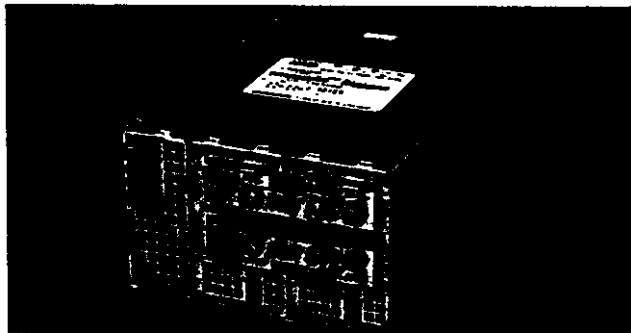
800-2000 WATTS



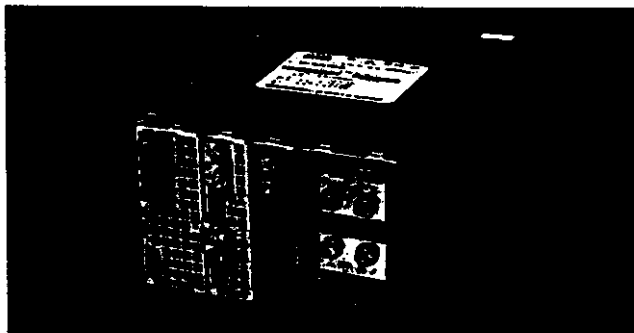
VS1 - B2 - H522 - 00
(600W) (500W) 1100W total



VS1 - L2 - 00
(1500W) 1500W total



VS3 - D2 - C2 - 20
(1200W) (900W) 2000W max total



VS3 - C2 - B3 - G25 - 00
(900W) (600W) (500W) 2000W total

VS Series

800-2000 Watts • 1 to 12 Outputs

VS is the first full-featured high power product with a PFC front end as a standard input. It is available in both single and multiple output versions with over one million different output combinations as standard. Offering a very compact footprint, the 1500 watt package measures 5" x 5" x 11", and the 2000 watt package measures 5" x 8" x 11".

SPECIAL FEATURES

- Power factor correction
- IEC 555-2 harmonic distortion compliance
- CISPR 22, EN55022 Level B conducted / radiated EMI
- IEC 801 immunity standards
- European CE Mark
- Current share on all outputs
- Remote sense on all outputs
- Overload protection on all outputs
- Voltage adjustment on all outputs
- Margining on all outputs
- AC OK signal (two logics)
- Global DC OK (two logics)
- DC OK signal and status indicator LED on all outputs
- Global and individual module inhibits/enable
- 3 year warranty

SAFETY

UL	UL1950
CSA	CSA22.2 - 950
IEC	IEC950, Class 1
VDE	EN60950
TUV	EN60950

FILE NUMBERS

UL	E133211
CSA	LR42001B
VDE	79579 & 79580
TUV	R9272192 & R9272191

ENVIRONMENTAL

Operating temperature: -10°C to 50°C (derate each output linearly to 60% at 70°C) 40°C max for reverse air (option #1)

Shock/Vibration: Mil-Hdbk 810E

Humidity: 95% non-condensing

Storage temperature: -55°C to +85°C

Temperature coefficient: 0.02% per °C

Cooling: Internal DC fan 24V

ELECTRICAL SPECIFICATIONS

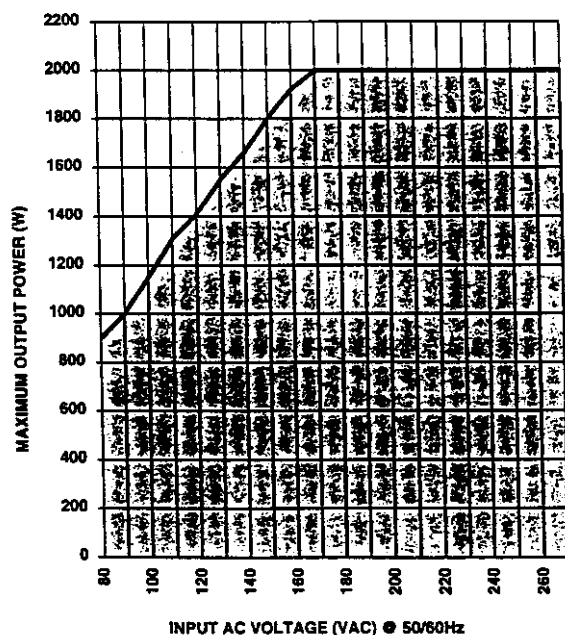
Input

Fuse rating. 600 V/25 A (internal)
 Input voltage 85 to 264 VAC; See operating curve
 Frequency 47 to 440 Hz
 Inrush current 40 A peak max
 Efficiency 75% - 82%
 Power factor 0.99 typical
 Turn-on time AC / 1 sec; Inhibit / 100 ms max
 EMI filter CISPR 22, EN55022 Level B conducted/radiated
 Leakage current 2 mA max at 264 VAC
 Holdover storage 20 ms minimum/40 ms typical independent of VAC
 AC OK
 warning time > 5ms (power fail)

Output

Adjustment range . . . ± 10% minimum
 Margining ± 4-6% nominal
 Line/load reg 0.2% or 5 mV max
 Ripple RMS: 0.1% or 10 mV
 P-P: 1.0% or 50 mV
 Bandwidth limited to 20 MHz
 Dynamic response. . . 2% or 100 mV with 25% load step (any output)
 Recovery time To within 1% in < 300µsec
 Overvoltage protection. 2 to 5 V 122% to 134% of output voltage; 12 to 28 V 110% to 120%; recycle AC
 Overload protection. Main: 105% to 120% of rated current
 Auxiliaries: 105% to 140%
 Short circuit protection. Protected for continuous short circuit, recovery automatic
 Reverse voltage protection. 100% of rated output current
 Thermal protection . . . Each module thermally protected. Input module: auto recovery. Output modules; recycle AC.
 Remote sense Up to 0.5 V total drop
 Single wire parallel . . . Current share to 2% of total rated current
 Switching frequency . . 200 KHz(900-1500 watt module, 400 KHz)
 DC OK -2% to -6% of nominal

Operating Envelope



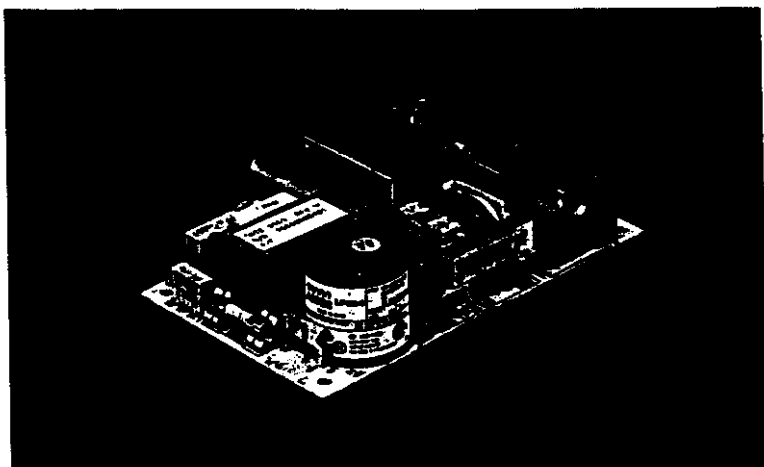
For example, 1400 watts is the maximum power that can be achieved at 120 VAC.

For application information, see Application Note D1 or PowerFAX Doc. no 1159.

HIGH

LPS 25

25 WATTS



LPS Series

25 Watts • Single Output

The LPS Series of power supplies is an AC/DC universal input, single output design offering the latest in high technology performance. This rugged PCB design measures only 3" x 5" and features Class B EMI, high efficiency, and very high reliability. The LPS Series is ideal for telecommunication and computer peripheral applications, test and industrial equipment, medical instrumentation, and business machines.

SPECIAL FEATURES

- Universal input
- High efficiency
- Remote sense
- Built-in EMI filter
- Low output ripple
- Adjustable output
- Overvoltage protection
- Overload protection
- Enclosure kit available (see page 27 or PowerFAX Doc. no 1025)

ENVIRONMENTAL

Operating temperature:
0° to 50°C ambient; derate each output at 2.5% per degree from 50° to 70°C

Electromagnetic susceptibility:
designed to meet IEC 801,-2, -3, -4, -5, -6, Level 3

Humidity: Operating; non-condensing 5% to 95%

Vibration: Three orthogonal axes, sweep at 1 oct/min, 5 min. dwell at four major resonances 0.75G peak 5 Hz to 500 Hz, operational

Storage temperature: -40° to 85°C

Temperature coefficient: $\pm .04\%$ per degree C

MTBF demonstrated: > 550,000 hours at full load and 25°C ambient conditions

ELECTRICAL SPECIFICATIONS

Input

Input range 85 VAC to 264 VAC; 120 to 370 VDC
Frequency 47 - 440 Hz
Inrush current < 15 A peak @ 115 VAC; < 30 A peak @ 230 VAC, cold start @ 25°C
Input current 1 A max. (RMS) @ 115 VAC
Efficiency 70% typical at full load
EMI filter FCC Class B conducted, CISPR 22 Class B conducted, EN55022 class B conducted and VDE 0878 PT3 class B conducted

Safety ground

leakage current < 0.5mA @ 50/60Hz, 264 VAC input

Output

Maximum power 25 W for convection; 40 W with 30 CFM forced air
Adjustment range -5, +10% minimum
Hold-up time 20 ms at 25 watt load and 115 VAC nominal line
Overload protection Short circuit protection on all outputs. Case overload protected @ 110% to 145% above peak rating
Overvoltage protection 5V output: 5.7 to 6.7 VDC. Other outputs 10% to 25% above nominal output

SAFETY & FILE NUMBERS

VDE	0805/EN60950 (IEC950)	11774-3336-1241 (LC#84936)
UL	UL1950	E132002
CSA	CSA 22.2-234 Level 3	LR53982C
NEMKO	EN 60950/EMKO-TUE (74-sec) 203	P95100442
BABT	EN60950/BS7002	PS/605316
CB	Certificate and report	1577, 1578, 1579, 1580
CE	Mark	

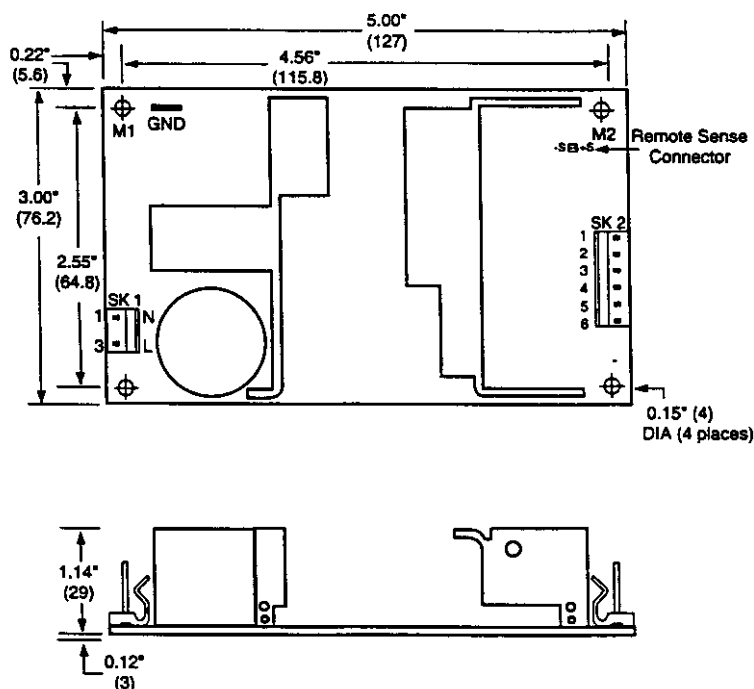
ORDERING INFORMATION

Model Number	Output Voltage	Minimum Load	Maximum Load with Convection Cooling	Maximum Load with 30 CFM Forced Air	Peak Load ¹	Regulation ²	Ripple P/P (PARD) ³
LPS22	5 V	0 A	5 A	8 A	9 A	± 2%	50 mV
LPS23	12 V	0 A	2.1 A	3.3 A	3.7 A	± 2%	120 mV
LPS24	15 V	0 A	1.7 A	2.7 A	3 A	± 2%	150 mV
LPS25	24 V	0 A	1.1 A	1.8 A	1.9 A	± 2%	240 mV

1. Peak current lasting < 30 seconds with a maximum 10% duty cycle.
2. At 25°C including initial tolerance, line voltage, load currents and output voltages adjusted to factory settings.
3. Peak-to-peak with 20 MHz bandwidth and 10 μ F in parallel with a 0.1 μ F capacitor at rated line voltage and load ranges.

LOW

DRAWINGS



PIN ASSIGNMENTS

Connector	LPS22	LPS23	LPS24	LPS25
SK1-1	Neutral	Neutral	Neutral	Neutral
SK1-3	Line	Line	Line	Line
SK2-1	+5 V	+12 V	+15 V	+24 V
SK2-2	+5 V	+12 V	+15 V	+24 V
SK2-3	+5 V	+12 V	+15 V	+24 V
SK2-4	Common	Common	Common	Common
SK2-5	Common	Common	Common	Common
SK2-6	Common	Common	Common	Common

MATING CONNECTORS

AC Input: Molex 09-50-8031 (USA)
09-91-0300 (UK)
PINS: 08-58-0111

DC Outputs: Molex 09-50-8061 (USA)
09-91-0600 (UK)
PINS: 08-58-0111

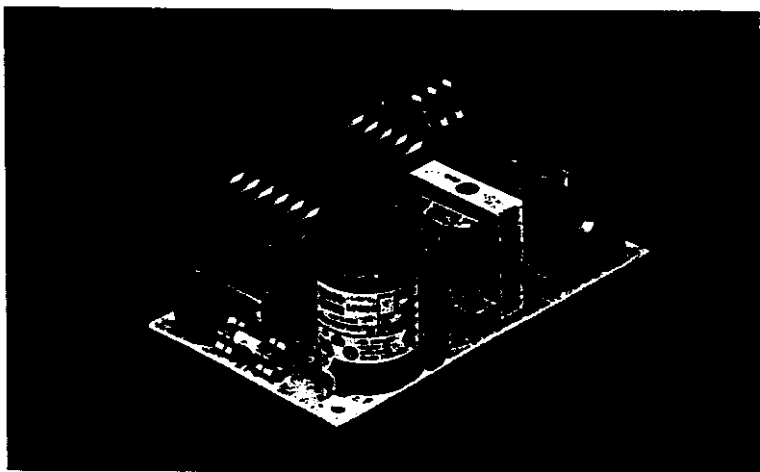
Remote Sense: 22-01-2025

NOTES

1. Specifications subject to change without notice.
2. All dimensions are in inches and (mm), tolerance is $\pm .01$ ".
3. Mounting holes M1 and M2 should be grounded for EMI purposes.
4. Mounting hole M1 is safety ground connection.
5. Specifications are for convection rating unless otherwise stated.
6. Warranty: 1 year
7. Weight: 0.5 lb / 0.23 kg

LPS 60

60 WATTS



LPS Series

60 Watts • Single Output

The LPS Series of power supplies is an AC/DC universal input, single output design offering the latest in high technology performance. This rugged PCB design measures only 3" x 5" and features Class B EMI, high efficiency, and very high reliability. The LPS Series is ideal for telecommunications and computer peripheral applications, test and industrial equipment, medical instrumentation, and business machines.

SPECIAL FEATURES

- Universal input
- High efficiency
- Remote sense
- Built-in EMI filter
- Low output ripple
- Adjustable output
- Overvoltage protection
- Overload protection
- Enclosure kit available (see page 28 or PowerFAX Doc. no 1025)

ENVIRONMENTAL

Operating temperature:

0° to 50°C ambient; derate each output at 2.5% per degree from 50° to 70°C

Electromagnetic susceptibility:

designed to meet IEC 801,-2, -3, -4, -5, -6, Level 3

Humidity: Operating; non-

condensing 5% to 95%

Vibration: Three orthogonal axes,

sweep at 1 oct/min, 5 min. dwell at four major resonances 0.75G peak 5 Hz to 500 Hz, operational

Storage temperature: -40° to 85°C

Temperature coefficient: $\pm .04\%$ per degree C

MTBF demonstrated: > 550,000 hours at full load and 25°C ambient conditions

ELECTRICAL SPECIFICATIONS

Input

Input range 85 VAC to 264 VAC; 120 to 370 VDC

Frequency 47 - 440 Hz

Inrush current < 18 A peak @ 115 VAC; < 36 A peak @ 230 VAC; cold start @ 25°C

Input current 1.5 A max. (RMS) @ 115 VAC

Efficiency 70% typical at full load

EMI filter FCC Class B conducted, CISPR 22 Class B conducted, EN55022 class B conducted and VDE 0878 PT3 class B conducted

Safety ground

leakage current < 0.5mA @ 50/60Hz, 264 VAC input

Output

Maximum power . . . 60 W for convection; 80 W with 30 CFM forced air

Adjustment range . . -5, +10% minimum

Hold-up time 20 ms at 60 watt load and 115 VAC nominal line

Overload

protection Short circuit protection on all outputs. Case overload protected @ 110% to 145% above peak rating

Overvoltage

protection 5V output: 5.7 to 6.7 VDC. Other outputs 10% to 25% above nominal output

SAFETY

VDE 0805/EN60950 (IEC950) 11774-3336-1255 (LC #86665)

UL UL1950 E132002

CSA CSA 22.2-234 Level 3 LR53982C

NEMKO EN 60950/EMKO-TUE P95100123
(74-sec) 203

BABT EN60950/BS7002 PS / 605272

CB Certificate and report 1521, 1522, 1523, 1524

CE Mark

ORDERING INFORMATION

Model Number	Output Voltage	Minimum Load	Maximum Load with Convection Cooling	Maximum Load with 30 CFM Forced Air	Peak Load ¹	Regulation ²	Ripple P/P (PARD) ³
LPS61	3.3V	0A	12A	16A	18A	± 2%	33 mV
LPS62	5 V	0 A	12 A	16 A	18 A	± 2%	50 mV
LPS63	12 V	0 A	5 A	6.7 A	7.5 A	± 2%	120 mV
LPS64	15 V	0 A	4 A	5.3 A	6 A	± 2%	150 mV
LPS65	24 V	0 A	2.5 A	3.3 A	3.8 A	± 2%	240 mV
LPS68	48V	0A	1.3A	1.7A	1.9A	± 2%	480 mV

1. Peak current lasting < 30 seconds with a maximum 10% duty cycle.

2. At 25°C including initial tolerance, line voltage, load currents and output voltages adjusted to factory settings.

3. Peak-to-peak with 20 MHz bandwidth and 10 µF in parallel with a 0.1 µF capacitor at rated line voltage and load ranges.

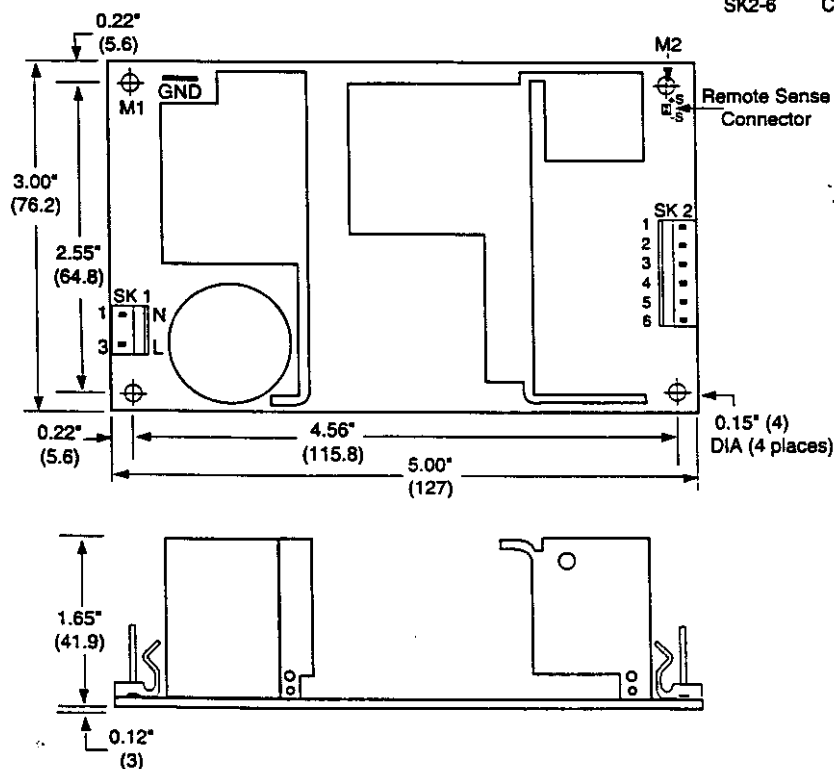
\$ 33.⁰⁰/1000 \$ 45.⁰⁰/100
\$ 30.⁰⁰/500 \$ 65.⁰⁰/Piece

LOW

PIN ASSIGNMENTS

Connector	LPS61	LPS62	LPS63	LPS64	LPS65	LPS68
SK1-1	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
SK1-3	Line	Line	Line	Line	Line	Line
SK2-1	3.3V	+5 V	+12 V	+15 V	+24 V	48V
SK2-2	3.3V	+5 V	+12 V	+15 V	+24 V	48V
SK2-3	3.3V	+5 V	+12 V	+15 V	+24 V	48V
SK2-4	Common	Common	Common	Common	Common	Common
SK2-5	Common	Common	Common	Common	Common	Common
SK2-6	Common	Common	Common	Common	Common	Common

DRAWINGS



MATING CONNECTORS

AC Input: Molex 09-50-8031 (USA)
09-91-0300 (UK)
PINS: 08-58-0111

DC Outputs: Molex 09-50-8061 (USA)
09-91-0600 (UK)
PINS: 08-58-0111

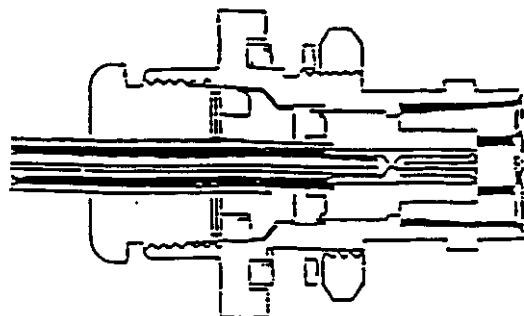
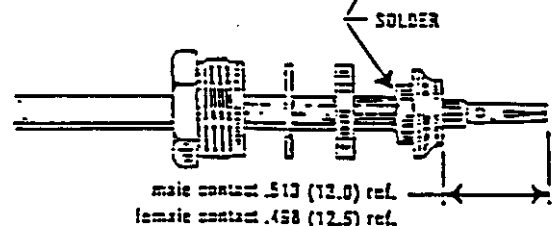
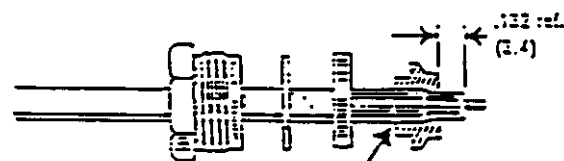
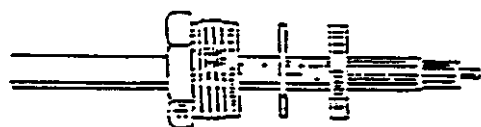
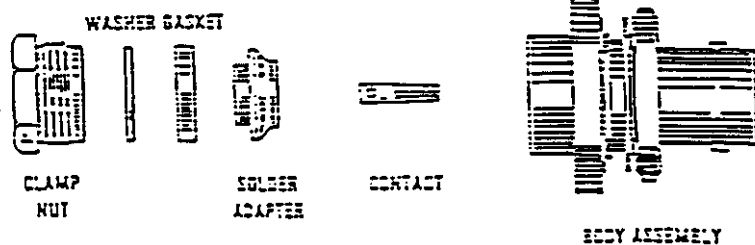
Remote Sense: 22-01-2025

NOTES

- Specifications subject to change without notice.
- All dimensions are in inches and (mm), tolerance is ± .01".
- Mounting holes M1 and M2 should be grounded for EMI purposes.
- Mounting hole M1 is safety ground connection.
- Specifications are for convection rating unless otherwise stated.
- Warranty: 1 year
- Weight: 0.75 lb./0.34 kg

BNC ASSEMBLY INSTRUCTIONS

SOLDER-TYPE



Trim cable square, deburr and clean copper jacket 5/8" (15.9) minimum. Strip to dimensions shown.

Slide clamp nut, washer and gasket over cable jacket as shown.

Slide solder adapter into position over cable so that outer conductor bottoms on internal shoulder. Solder as shown. Avoid excessive heat which may deform dielectric. After assembly has cooled, verify dimension shown and trim dielectric if necessary.

Solder center contact to inner conductor. Center contact must seat square against dielectric. Again, avoid excessive heat which may deform dielectric. Verify dimension shown to assure mechanical and electrical integrity of assembly.

Insert cable assembly into body assembly. Move gasket and washer into position and tighten clamp nut.

BLACK/WHITE CONTACT HOUSINGS (1058-2020)

<u>DESCRIPTION</u>	<u>PART NO.</u>	<u>MANUFACTURER</u>
This first group of items refers to the small, black plugs that connect to boards.		
Plug - 2 Pos. - .1" Ctrs.	87499-3	AMP
Plug - 3 Pos. - .1" Ctrs.	87499-5	AMP
Plug - 4 Pos. - .1" Ctrs.	87499-7	AMP
Plug - 5 Pos. - .1" Ctrs.	87499-9	AMP
Plug - 6 Pos. - .1" Ctrs.	1-87499-1	AMP
Plug - 7 Pos. - .1" Ctrs.	87499-1	AMP
Plug - 8 Pos. - .1" Ctrs.	1-87499-3	AMP
Plug - 9 Pos. - .1" Ctrs.	1-87499-5	AMP
Plug - 10 Pos. - .1" Ctrs.	1-87499-7	AMP
Plug - 11 Pos. - .1" Ctrs.	1-87499-9	AMP
Plug - 12 Pos. - .1" Ctrs.	2-87499-1	AMP
Female Receptacle for .1" Ctrs. Plugs	1-87509-4	AMP
Keying Plug for .1" Ctrs. Plugs	87077-2	AMP
Hand Tool	90345-1	AMP
This second group of items refers to the larger white plugs which also connect to boards.		
Plug - 4 Pos. - .156" Ctrs.	1-87025-3	AMP
Plug - 5 Pos. - .156" Ctrs.	2-87025-3	AMP
Plug - 8 Pos. - .156" Ctrs.	1-87025-6	AMP
Plug - 10 Pos. - .156" Ctrs.	1-87025-8	AMP
Plug - 12 Pos. - .156" Ctrs.	1-87025-2	AMP
Plug - 14 Pos. - .156" Ctrs.	3-87025-8	AMP
Female Receptacle for .156" Ctrs.	102104-2	AMP
Keying Plug for .156" Ctrs. Plug	87116-2	AMP
Hand Tool	90274-2	AMP

RF CONNECTORS

<u>DESCRIPTION</u>	<u>PART NO.</u>	<u>MANUFACTURER</u>
<u>"N" TYPE</u>		
Jack - Female - Bulkhead - For RG-55	36250	Amphenol
Plug - Male - For RG-53 & RG-55	34025	Amphenol
Jack - Female - Bulkhead - For UT-141	R161-277	Amphenol
Plug - Male - Straight - For RG-213	82-3202	Amphenol
Plug - Male - Right Angle - For RG-213	R161-168	Amphenol
<u>"BNC" TYPE</u>		
Plug - Male - For RG-58	31-202	Amphenol
Plug - Male - For RG-174	225395-7	Amphenol
Plug - Male - For RG-179	225395-8	Amphenol
Jack - Female - For RG-174	225398-7	Amphenol
Jack - Female - Bulkhead	51-236	Amphenol
Jack - Female - Bulkhead - Isolated Ground	UBJ27	Trompeter
<u>"SMA" TYPE</u>		
Plug - Male - Straight - For RG-55	142-0261-001	E.F. Johnson
Plug - Male - Right Angle - For RG-55	142-0262-001	E.F. Johnson
Plug - Male - Straight - For RG-174 & 188	142-0221-001	E.F. Johnson
Plug - Male - Right Angle - For RG-174 & 188	142-0222-001	E.F. Johnson
Plug - Male - Straight - For UT-141	142-0281-001	E.F. Johnson
Barrel Connector - Female-Female	901-302	Amphenol
<u>"F" TYPE</u>		
Jack - Female - Bulkhead	1220	RMS

CIRCULAR TYPE CONNECTORS

<u>DESCRIPTION</u>	<u>PART NO.</u>	<u>MANUFACTURER</u>
Receptacle - 4 Position - Sockets	206060-1	AMP
Receptacle Flange Mt. - 15 Position - Sockets	206705-1	AMP
Receptacle - 37 Position - Sockets	206150-1	AMP
Receptacle - Reverse Sex - 37 Pos - Sockets	206306-2	AMP
Plug - Reverse Sex - 37 Position - Pins	206305-1	AMP
Plug - 37 Position - Pins	206151-1	AMP
Plug - 15 Position - Pins	206703-1	AMP
Plug - 4 Position - Pins	206061-1	AMP
Pins - Solder Type	66180-1	AMP
Sockets - Solder Type	66181-1	AMP
Insertion/Extraction Tool	305183-R	AMP
Rear Cover - Strain Relief - 37 Position	206133-1	AMP
Rear Cover - Strain Relief - 4 Position	206062-1	AMP
Strain Relief - 15 Position	206966-1	AMP

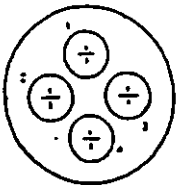
Plug



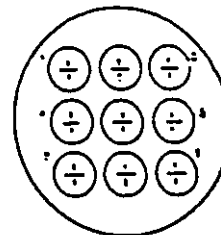
Receptacle



4 Pos.

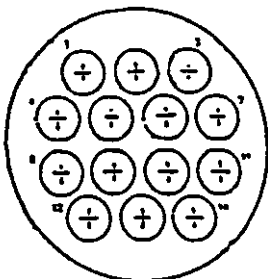


9 Pos.

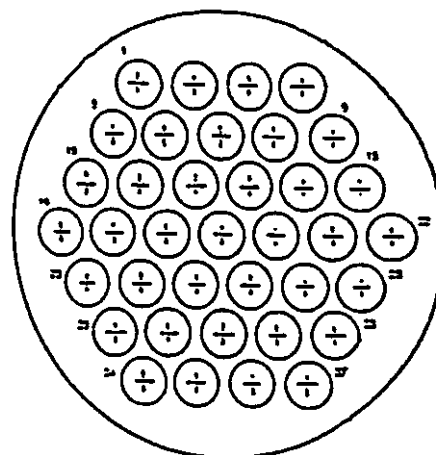


Note: Contact arrangements shown are of pin mating face (plug or receptacle)
Socket mating face is mirror image

14 Pos.



37 Pos.



Pin

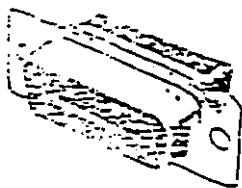


Socket

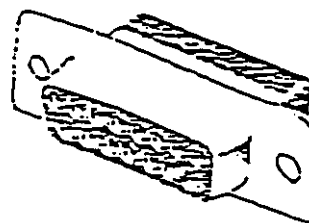
"D" TYPE CONNECTORS (1053-2020)

<u>DESCRIPTION</u>	<u>PART NO.</u>	<u>MANUFACTURER</u>
Receptacle - 9 Position	205203-1	AMP
Receptacle - 15 Position	205205-1	AMP
Receptacle - 25 Position	205207-1	AMP
Receptacle - 37 Position	205209-1	AMP
 Sockets - Solder Type	 66569-1	 AMP
Plug - 9 Position	205204-1	AMP
Plug - 15 Position	205208-1	AMP
Plug - 25 Position	205210-1	AMP
Plug - 37 Position	205210-1	AMP
 Pins - Solder Type	 66570-3	 AMP
Insertion/Extraction Tool (Crimp Type)	91067-3	AMP
 Insertion/Extraction Tool (Solder Type)	 91067-2	 AMP
Strain Relief - 9 Position	207467-1	AMP
Strain Relief - 15 Position	207470-1	AMP
Strain Relief - 25 Position	207475-1	AMP
Strain Relief - 37 Position	207473-1	AMP
 Screw and Retainer Hardware	 205980-1	 AMP
Standoffs and Mounting Hardware	205817-1	AMP

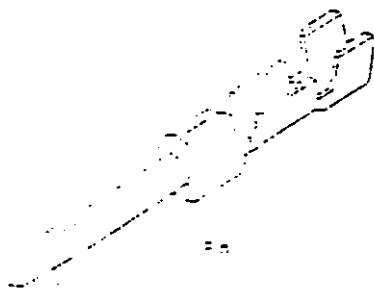
Plug



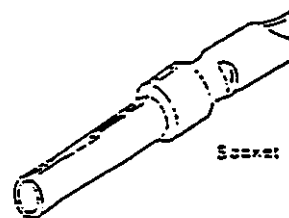
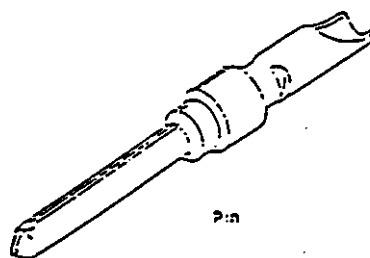
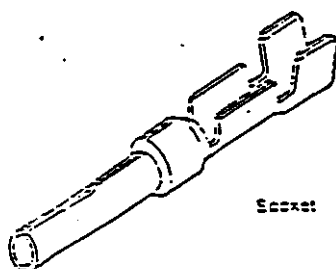
Receptacle



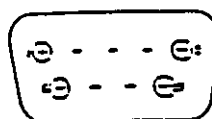
Wiring Type Contacts,
Snap-In



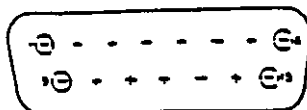
Solder Cup Contacts,
Snap-In



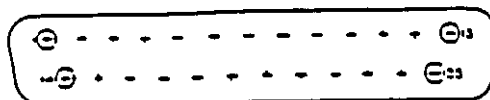
Insert Arrangements



9 Position
(Shell Size 1)



15 Position
(Shell Size 2)



25 Position
(Shell Size 3)



37 Position
(Shell Size 4)

Note: Contact arrangements shown are for pin
mating side (plug or receptacle).
Socket mating side is mirror image.

MAINTENANCE

This product is designed with components that require no periodic maintenance except for cleaning and record keeping.

The amount of cleaning necessary depends greatly on the conditions in the transmitter room. While the electronics have been designed to function well even if covered with dust, heavy buildups of dirt and insects will impede the effectiveness of the cooling and lead to shutdown or premature failure.

When it is apparent that the front panel is becoming dust covered, the top cover should be opened and the accumulated foreign material removed. A small, soft brush used in conjunction with a plastic wand-like attachment on a small vacuum cleaner is an excellent way to suction the dirt out. Alcohol and other cleaning agents should not be used unless you can be certain that the solvents will not damage components or markings on the transmitter and boards. Water based cleaners can be used, if only a small amount of moisture is used. The fans and heatsinks should be cleaned carefully.

Occasionally check that all RF connections are secure, but be careful not to overtighten.

Data should be recorded for all meter readings on a regular basis. It is suggested that data be recorded once each month and that it be retained in a rugged folder or envelope for the life of the equipment. A sample format of a log sheet is included at the end of this section. Photocopies of this sheet may be used for log purposes if desired.

PROBLEM ANALYSIS

In most cases the performance of a GaAs FET transistor is closely related to the DC operation of the system. Any degradation of signal quality, gain or power is usually related to a corresponding change in a DC parameter somewhere in the system. An exception may be a defective RF input or output connection which can result in poor performance of the amplifier with all DC parameters appearing normal.

The first step of analysis is therefore to carefully measure all DC parameters and compare these to the numbers indicated on the schematics, block diagrams and factory test data sheet. Each GaAs FET operates with $\approx -5V$ of bias on the gate and $\approx 10.2V$ maximum on the drain. The static current of a GaAs FET is determined by measuring across the associated .05 ohm resistor, located on the bias protection board, and using ohm's law. If all DC parameters are normal, an RF intermittency should be suspected. Follow the RF path from input to the output and apply a small physical force on all connectors while observing the output power. If an intermittency is detected, a simple resoldering can be attempted. While following these procedures, it is important maintain terminations on all amplifier circuits to avoid VSWR damage.

This transmitter contains a fan for cooling purposes. These fans have enclosed bearings that require no external lubrication. Periodically check the fans for free blade movement and also clean the fans as needed. Before a fan fails, it will normally begin to exhibit noisy operation. Obtain a replacement fan if needed. Do not operate the transmitter for a long period of time if one of the fans fail.

REPAIR PROCEDURES

Repair of this transmitter assembly normally involves module level replacement. ITS Corporation maintains an adequate stock of replacement modules. If you have determined that a particular subassembly is defective and that it cannot be easily repaired at your facility, please contact the ITS Service Company. An effort will be made to provide a module on an exchange basis. It is often possible to ship replacement modules counter-to-counter or one-day UPS Federal Express to expedite delivery.

On some occasions it is necessary or desirable to affect component level repairs. In many cases, failures can be a result of poor connections somewhere in the system. Poor connections can generally be repaired with a suitable, small, grounded soldering iron. A spare parts kit of standard components is available for this transmitter. Please contact the ITS Microwave Marketing Department for the price and availability of the spare parts kit. Individual components can be ordered from Microwave Marketing Departments of ITS. The fuses are standard and generally available at local parts distributors. The parts lists in this manual provide complete manufacturer's information and part numbers for all standard electrical components. These components can often be obtained from local distributors. An effort has been made to select standard (off-the-shelf) components whenever possible in the product design. Replacement of the GaAs FET devices in the field is not recommended, although with special factory instructions, it can be successfully accomplished. It is important to realize that each GaAs FET operates at a specific bias voltage that must be preset before the main power supply is turned on. Failure to provide the proper bias voltage will result in rapid GaAs FET destruction.