

# TELEPHONE PRODUCTS 



WEBSTER WT ELECT RIC

# COMMUNICATIONS <br> DIVISION 

 TLC series telephone products$\qquad$

Effective Date: Aug. 1, 1967. Prices subject to change.
Delivery: F.O.B. Lebanon, Kentucky.
Terms: 1\% 10th Prox.
power supplies

| Model | Description | Telephone Co. <br> Suggested <br> Net Price |
| :--- | :--- | :---: |
| 101 | Power Supply; 24VDC @ 100 MA Output | $\$ 28.00$ |
| 102 | Power Supply; 24VDC @ 100 MA Regulated Output | 30.00 |
| 106 | Power Supply; 48VDC @ 100 MA Output | 31.00 |
| 107 | Power Supply; 24VDC @ 3.0 Amp, Regulated | 165.00 |
| 108 | Power Supply; 24VDC @ 300 MA Output | 48.50 |

amplifiers

| Model | Description | Telephone Co. Suggested Net Price |
| :---: | :---: | :---: |
| TLC213 | Line Level Control Amplifier (SX) | \$54.50 |
| TLC214 | Line Level Control Amplifier (SL) | 54.50 |
| TLC215 | Line Level Control Amplifier (LM) | 54.50 |
| TLC317 | V.F. Amplifier (SX) | 28.50 |
| TLC318 | V.F. Amplifier w/Eq. Ckt. (SX) | 32.00 |
| TLC319 | V.F. Amplifier (SL) | 28.50 |
| TLC320 | V.F. Amplifier w/Eq. Ckt. (SL) | 32.00 |
| TLC321 | V.F. Amplifier (LM) | 28.50 |
| TLC322 | V.F. Amplifier w/Eq. Ckt. (LM) | 32.00 |
| TE1453 | V.F. Amplifier (V3 60 MA LM) | 28.50 |
|  | Note: For surge protection (add " $X$ " suffix to Model number) | 2.00 |
| TLC402 | Power Amplifier 2W Output (48VDC) | 47.50 |
| TLC407 | Power Amplifier 2W Output (24VDC) | 47.50 |
| TLC408 | Power Amplifier 2W Output (24VDC) ( 12 K Bridging Input) | 47.50 |


| Model | Description | Telephone Co. Suggested Net Price |
| :---: | :---: | :---: |
| TLC409 | Power Amplifier 2W Output (48VDC) | \$47.50 |
| TLC410 | Power Amplifier 2W Output (48VDC) ( 12 K Bridging Input) | 47.50 |
| TLC501 | Microphone Pre-amplifier (SX 12-24VDC) 150/600 ohm Output | 46.00 |
| TLC502 | Microphone PreAmplifier (LM 12-24VDC) HI - Z Output | 46.00 |
| TLC503 | Microphone Pre-amplifier (SX 24-48VDC) 150/600 ohm Output | 46.00 |
| TLC504 | Microphone Pre-amplifier (LM 24-48VDC) HI - Z Output | 46.00 |
| TLC505 | Microphone Pre-amplifier (SL 12-24VDC) 150/600 ohm Output | 46.00 |
| TLC506 | Microphone Pre-amplifier (SL 24-48VDC) 150/600 ohm Output | 46.00 |
| TLC601 | Bridging Amplifier; 120K Input Impedance: 150 ohm Output w/External Gain and Internal Equalizing control (SL 12-24VDC) | 46.00 |
| TLC602 | Bridging Amplifier; 120K Input Impedance: 150 ohm Output w/Internal Gain and Eq.Ckt. (SL 12-24VDC) | 46.00 |
| TLC603 | Bridging Amplifier (SL 48VDC) | 46.00 |
| TLC604 | Bridging Amplifier (SX 12\%24VDC) | 46.00 |
| TLC605 | Bridging Amplifier (SX 48VDC) | 46.00 |
| TLC606 | Bridging Amplifier (SL 48VDC) | 46.00 |
| TLC607 | Bridging Amplifier (SX 12-24VDC) | 46.00 |
| TLC608 | Bridging Amplifier (SX 48VDC) | 46.00 |
|  | Flat Repair Charge for Amplifiers | 12.00 |

term sets, repeaters and mountings

| Model | Description | Telephone Co. <br> Suggested <br> Net Price |
| :--- | :--- | :---: |
| TLC701 | $2-4$ Wire Term Set | 65.00 |
| TLC711 | $2-4$ Wire Term Set | 65.00 |
| TLC731 | Terminating Unit Shelf: wired, w/2 dummy strap thru <br> plugs. 19'rack mounting $1-3 / 4 '$ panel space |  |
| TLC732 | 2-4 Wire Terminating Unit: wired, w/Hybrids and equip- <br> ment box less Amplifiers, Idle Ckt. Relay and <br> power supply | 44.25 |
| TLC733 | Terminating Unit Shelf: for KTU Mounting: wired less <br> plug-in modules. | $\mathbf{6 1 . 0 0}$ |


| Model | Description | Telephone Co. Suggested Net Price |
| :---: | :---: | :---: |
| TLC734 | Terminating Unit Shelf: wired w/2 dummy plugs. 19' rack mounting. 1-3/4' panel space | \$85.00 |
| TLC735 | Terminating Unit Shelf: wired w/2 dummy plugs. For 15A or 16 type WECO Apparatus Box | 95.00 |
| TLC736 | Terminating Unit Shelf: wired w/2 dummy plugs. For KTU mounting | 44.25 |
| TLC737 | Terminating Unit Shelf: wired, For 19" rack mounting 1-3/4" panel space | 44.25 |
| TLC737-1 | Terminating Unit Shelf; wired, For 23" mounting 1-3/4" panel space | 44.25 |
| TLC738 | Mounting Shelf for 3 TLC711 term sets. For 19', rack mounting | 34.46 |
| TLC739 | Mounting Shelf for 4 TLC711 term sets. For 23'" mounting | 44.75 |
| TLC740 | Terminating Shelf (4 wire-4 wire) unit for KTU mounting | 44.25 |
| TLC741 | Terminating Shelf ( 4 wire-4 wire) unit for 19 '' rack mounting. 1-3/4'' panel space | 44.25 |
| TLC741-1 | Terminating Shelf ( 4 wire-4 wire) unit for 23 " mounting. 1-3/4" panel space | 44.25 |
| term set and transmission accessories |  |  |
| TLC801 | Equalizer | 56.50 |
| TLC802 | Equalizer | 56.50 |
| TLC811 | Pad Adaptor for WECO 89 Resistor | 8.00 |
| TLC812 | Series Dual Attenuators | 14.00 |
| TLC813 | Variable Attenuator | 27.00 |
| TLC831 | Hybrid Transformer (12 pin plug) | 18.00 |
| TLC831-11 | Hybrid Transformer (11 pin plug) | 18.00 |
| TLC832 | Repeat Coil | 34.00 |
| TLC833 | Line Transformer | 17.00 |
| TLC834 | Dual Transformer Assembly | 18.25 |
| TLC835 | Level Control Pad Adaptor w/Transformer | 17.50 |
| TLC836 | Level Control Pad Adaptor w/Transformer | 17.50 |
| TLC837 | Hybrid Coil Assembly | 36.00 |
| TLC851 | NBOC | 18.75 |
| TLC852 | Precision Network, Unloaded Cable | 29.00 |
| TLC853 | Precision Network, H88 Cable | 58.00 |
| TLC854 | Precision Network, Open Wire | 37.00 |
| TLC855 | Adjustable Compromise Network | 28.35 |
| TLC866 | Low Pass Filter (0-3KC) | 30.00 |
| TLC867 | Low Pass Filter (0-3KC) | 30.00 |
| TLC881 | Idle Circuit Relay - 500 ohm Coil | 14.00 |


| Model | Description | Telephone Co. Suggested Net Price |
| :---: | :---: | :---: |
| TLC882 | Idle Circuit Relay - 1500 ohm Coil | \$14.00 |
| TLC883 | Idle Circuit Relay - 500 ohm Coil | 16.00 |
| TLC884 | Idle Circuit Relay - 1500 ohm Coil | 16.00 |
| TLC891 | Strap thru | 4.50 |
| TLC892 | Strap thru | 4.50 |
| TLC893 | Strap thru | 4.50 |
| TLC894 | Amplifier Mtg. Adaptor | 7.45 |
| TLC895 | Equalizer Mtg. Adaptor | 8.50 |
| mounting hardware |  |  |
| TLC902 | Equipment Box | 20.00 |
| TLC903 | Equipment Box w/TLC101 Power Supply | 46.00 |
| TLC904 | Mounting Shelf for 10 Amplifiers for $19^{\prime \prime}$ rack $1-3 / 4^{\prime \prime}$ panel space | 8.50 |
| TLC905 | Mounting Shelf for 12 Amplifiers for $23^{\prime \prime}$ mounting 1-3/4' panel space | 10.50 |
| TLC909 | Mounting Shelf for 2 Amplifiers w/Test Jacks. KTU mounting (JKTU) | 29.00 |
| TLC910 | Mounting Shelf for 2 Amplifiers w/Test Jacks. KTU mounting (JKTU-A) | 32.50 |
| TLC911 | Plug-in Jack Assembly for TLC912 (GJ1002) | 14.00 |
| TLC912 | Mounting Shelf for 5 Amplifiers and 5 TLC911 Jack Assemblies: For $19^{\prime \prime}$ rack $1-3 / 4^{\prime \prime}$ panel space (GB 055J19) | 50.00 |
| TLC913 | Mounting Shelf for 6 Amplifiers and 6 TLC911 Jack Assemblies: For $23^{\prime \prime}$ mounting 1-3/4' panel space (GB066J23) | 56.00 |
| TLC914 | Amplifier Extractor Tool (602) | 3.50 |
| TLC915 | Mounting Bracket for one Amplifier for WECO 105A Box (GB100) | 4.75 |
| TLC916 | Mounting Plate: For 3 plug in modules: KTU mounting | 18.75 |
| special equipments |  |  |
| TE1377A | Special - Terminating Unit Shelf equipped w/TE1377B Idle Ckt. Relay | 69.85 |
| TE1377B | Special - Idle Ckt. Relay | 25.50 |
| TE1414 | Special - 4 wire 7 way conference bridge network | 168.75 |
| TE1453 | V.F. Amp. 60 MA Drain (1-9 24.51) (10-499 22.80) | 28.50 |

FUNCTION：
To provide operating power（ 100 MA ）for voice frequency（VF）Amplifiers．

## SPECIFICATIONS：

Input Voltage：
Input Power（Max．）：
Input Fuse：
Input Power Connectien：
Output Power：
Ripple Voltage：
Output Power Connections：
Size：
Weight：

TLC 901
105－125 VAC，50－60 CPS
3 Watts at full load
$1 / 8 \mathrm{~A}, 125 \mathrm{~V}$
3 Prong plug with 5 ft ．cord
24 VDC＠ 100 MA
1 MV at full load
$6^{\prime \prime}$ white $\&$ red wire with spade lugs $1-5 / 8 \times 1-5 / 8 \times 7-1 / 4$
26 oz ．

## TLC 906

```
105-125 V AC, 50-60 CPS
6 Watt at full load
1/8 A, 125 V
3 Prong plug with }5\textrm{ft}\mathrm{ . cord
48 VDC @ 100 MA
M MV at full load
6" white & red wire with spade lugs
1-5/8 \times 1-5/8 x 7-1/4
26 oz.
```



specifications, installation and maintenance manual


## FUNCTION

Provide regulated power supply for voice frequency (VF) amplifiers and other communication devices requiring constant voltage operating power with minimum ripple content.

## INSTALLATION

1. TLC102 is designed to mount in the TLC902 equipment box, TLC904, 905,916 mounting shelves. It may be mounted in other mountings containing the proper 11 pin receptacle.
2. Wire connections at receptacle:
(a). 117 VAC source to Pins 1 and 3.
(b). Negative ( - ) 24VDC to Pin 8.
(c). Positive (+) 24 VDC to Pin 9.
(d). Chassis ground to Pin 11.

NOTE: Positive ( + ) side of this power supply is not grounded. If grounded positive ( + ) is required, connect Pin 9 to Pin 11 on mating receptacle, or to other desired ground.

105-125 VAC, 50-60 CPS.
6.25 watts at full load.
$1 / 16 \mathrm{~A}-250 \mathrm{~V}$
Pins 1 and 3 of mating receptacle.
24 VDC at 100 MA .
Nominal voltage $\pm 1$ volt, full load to no load.
0 C to +60 C ambient.
2 MV maximum at full load.
26 oz.
$1-5 / 6^{\prime \prime} \times 1-5 / 8^{\prime \prime} \times 5-5 / 8^{\prime \prime}$ overall.
Zinc plate with dichromate finish.
11 pin, (Amphenol 86CP11).


I. ALL RESISTORS $1 / 2 \mathrm{~W} \quad 10 \%$
2. ALL CAPACITORS IN UF
3. CAPACITOR POLARITY $\rightarrow+$
$\qquad$

## FUNCTION：

To provide 24 VDC operating power to ten 300 MA loads．

## SPECIFICATIONS：

Input Voltage：
Input Power（Max．）：
Input Fuse：
Input Power Connection：
Output Voltage：
Output Power（Max．）：
Output Connections：
Output Fuses：
Ripple Voltage：
Requlation：
Controls：

## Meter Range：

Voltage Adjustment：
Transistors：
Diodes：
Short Circuit Protection：
Size：
Construction：
Finish：

105－125 VAC，50－60 CPS＠1．1 Amps RMS
125 Watts at full load
$2 \mathrm{~A}, 125 \mathrm{~V}$ ，
7 ＇cord with attached 3 prong plug，also plugs into unit．
24 VDC＠ 3 Amps total
72 Watts total at full load
1－screw type－． 3 Amps each
One 3 Amp，Main Fuse
Ten 3 Amp，Protection at each output
Max 2 MV at full load
$\pm 1$ Volt no load to full load
AC on／off switch，DC Voltage Adjustment，selector switch and meter to check
main DC Voltage and DC Voltage at each of 10 outputs．
0 to 30 Volts DC
Adjusts main output to 24 volts
Four Total（2）－2N3232 Silicon，（1）－2N269 and（1）－2N301 Germanium
Four Total（4）－367D 10A 200V．
Fuse protection of Transistors under all operating conditions．
19＇＇Rack Mt．x 3－1／2 high x 8＇＇deep
16 gauge metal－removable front panel－perforated screen top and bottom for ventalation．
Telephone grey baked enamel．





## FUNCTION：

To provide 300 MA operating power for voice frequency（VF）Amplifiers．

## SPECIFICATIONS：

| Input Voltage： | $105-125 \mathrm{VAC}, 50-60 \mathrm{CPS}$ |
| :--- | :--- |
| Input Power（Max．）： | 15 Watts at full load |
| Input Fuse： | $1 / 4 \mathrm{~A}, 125 \mathrm{~V}, \mathrm{SLO}-\mathrm{BLO}$ |
| Input Power Connection： | 3 Prong plug with 5 ft. cord |
| Output Power： | 24 VDC 300 MA |
| Ripple Voltage： | 2 MV at full load |
| Output Power Connections： | Thru 11 point Octal type plug |
| Size： | $2-11 / 32 \times 3-3 / 32 \times 7-1 / 4$ |
| Weight： |  |

INSTALLATION：
1．Power supply can be mounted in Webster TLC equipment boxes，mounting shelves or outside，at any desired location．
2．A grounding type outlet is required for 3 prong plug at the cord providing input power for power supply．If grounding type outlet is not available，use a 3 to 2 prong adaptor and connect grounding terminal on adaptor to ground．Do not break off grounding prong of plug．


Incorporating the latest advances in circuit design the following new model numbers have been assigned.

| 200 Series | 300 Series |  |
| :--- | :--- | :--- |
| TLC213 | TLC317 | TLC320 |
| TLC214 | TLC318 | TLC321 |
| TLC215 | TLC319 | TLC322 |

400 Series
TLC407
TLC408
TLC409
TLC410

The cross reference charts below will quickly allow you to convert model numbers when ordering.

| 200 Series |  |
| :---: | :---: |
| If Model <br> Number <br> is | Order |
| TLC201 | TLC213 |
| TLC202 | TLC214 |
| TLC203 | TLC213 |
| TLC204 | TLC213 |
| TLC205 | TLC214 |
| TLC206 | TLC213 |
| TLC207 | TLC215 |
| TLC208 | TLC215 |
| TLC209 | TLC215 |
| TLC210 | TLC215 |


| 300 Series |  |
| :---: | :---: |
| If Model <br> Number <br> is | Order |
| TLC301 | TLC317 |
| TLC302 | TLC320 |
| TLC303 | * Spec. |
| TLC304 | TLC317 |
| TLC305 | TLC320 |
| TLC306 | * Spec. |
| TLC307 | TLC321 |
| TLC308 | TLC321 |
| TLC309 | TE1453 |
| TLC310 | TLC318 |
| TLC311 | TLC318 |
| TLC312 | *** |
| TLC315 | TLC317 |
| TLC316 | TLC317 |


| 400 Series |  |
| :---: | :---: |
| If Model <br> Number <br> is | Order |
| TLC401 | TLC407 |
| TLC402 | TLC409 |
| TLC403 | TLC408 |
| TLC404 | TLC410 |
| TLC405 | **Spec. |
| TLC406 | $* *$ Spec. |

* Special replacement for TLC303 and TLC306 are available on special order only. They have 50,000 ohm output impedance, $150 / 600$ ohm input impedance.
** Special replacements for TLC405 and TLC406 are available on special order only. These amplifiers have SL (split loop) wiring arrangement. They will be shipped as TE versions of TLC407 or TLC408.
*** TLC312 replacement available on special order only. This amplifier has 60 ma drain for V3 repeater application and is equipped with equalization circuit.


## COMMUNICATIONS DIV|SION line level control amplifiers. V.F. telephone line types. models TLC 201

## SPECIFICATIONS

Power Output (Max.)
Gain (Up to Control Threshold)
Control Threshold

GROUP I
+2 DBM
12 DB
-10 DBM

GROUP II
$+8 \mathrm{DBM}$
14 DB

- 6 DBM

Control Ratio (Min.) 30 to 1: A 30 DB increase in input above the control threshold results in 1 DB increase in output.
Input Impedance: 600 ohms (some models may be reconnected for 150 ohms loop).
Output Impedance: 600 ohms (some models may be reconnected for 150 ohms loop).
Frequency Response: -1 DB at 150 cps and $8000 \mathrm{cps},-3 \mathrm{DB}$ at 80 cps and $15,000 \mathrm{cps}$, referred to 1000 cps response.
Power Required: Nominal 24 VDC models, $12-26 \mathrm{~V}$ at $30-50 \mathrm{ma}$.
Nominal 48 VDC models, 24-52 V at 30-50 ma.
Total Distortion Harmonic (At full level control): $1 \%$ at higher value of nominal dc voltage range. ( 26 and 52 V ).
$1.5 \%$ at lower value of nominal dc voltage range. ( 12 and 24 V ).
Output Noise Level: 65 DB below output at higher value of nominal DC voltage range. ( 26 and 52 V ). 75 DB below output at lower value of nominal DC voltage range. ( 12 and 24 V ).
Monitor Winding: Test jack output is 11 DB below signal output with outputs loaded with 600 ohms.
Simplex Resistance: 5 ohms input winding, 13 ohms output winding (loop resistance 4 times the above).
Simplex Current: Max. 100 ma ( 5 ma max. unbalance).
Control Attock Time: 15 msec .
Control Release Time: 1.5 sec .
Dimensions: 1-5/8 x 1-5/8 x 7-5/8 overall.
Weight: 19 ounces.
Color: Zinc plate with dichromate finish
Plug: 11 pin, amphenol 86CP11.
Monitor Jacks: Accessible from front panel. Also connected to pins 5 and 6 with LM wiring.

## INSTALLATION:

1. Make the connections to mounting-socket pins as shown on schematic diagram on reverse side of this page. Observe polarity at supply-voltage pins $8(-)$ and $9(+)$. If polarity is reversed, amplifier will not operate but will not be damaged.
2. To install amplifier, plug it into assigned 11-pin socket. To remove, use approved extractor tool that fits into flange holes at front of amplifier.

## OPERATION:

The line level control amplifier is designed to accept a wide range of input signal amplitudes but to provide an output amplitude which varies only over a narrow range. The amplifier will:

1. Accept a wide range of signal levels.
2. Experience only a small increase in output in response to increases of input beyond some predetermined input level.
3. Have minimum distortion over the full designed range of operation.
4. Respond quickly to increases in input.
5. Present a constant impedance to the input line.
6. Present a constant impedance to the output line for signals imposed externally to the output of the amplifier. 7. Offer advantages of compactness and durability associated with transistors and other solid state devices.

Control of the amplifier is by means of a bridge network in the input circuit. A photocellis in one leg of the bridge and the bridge designed so that it is essentially balanced when the photocell is fully illuminated. A portion of the amplifier output is rectified, amplified, and used to light a lamp which in turn illuminates the photocell. With signals small enough to be below the control level, the feedback voltage is not enough to cause forward conduction by the rectifying diode and no voltage is applied to the lamp. The dark photocell results in an inbalance of the bridge so that nearly all the input signal is applied to the first stage of amplification. Under this condition the amplifier has linear gain characteristics.

At some designed output signal level, the feed-back voltage exceeds the knee of the diode causing good conduction by the diode. The resulting voltage is amplified and fed to the lamp, the photocell is illuminated, and the bridge brought very close to balance. Thus, only a small portion of the input signal is applied to the first amplifier stage

This method of control does not affect the operating point of the 2 -stage amplifier which acts as a low distortion, stabilized-gain amplifier with further characteristics outlined above. Typical values for the specific points are:

1. Signal levels from noise level up to +30 DBM may be applied to the input.
2. The output will rise to a value of approximately +2 DBM or +8 DBM linearly for an input of about -10 DBM or -6 DBM and then will rise only $1-2$ DBM more up to maximum input.
3. Maximum distortion is $1.5 \%$ with maximum compression.
4. Attack time is $10-15$ millisec.
5. Input impedance is 600 ohms $\pm 10 \%$.
6. Output impedance affecting reflections is 600 ohms $\pm 10 \%$.

## OPERATING INSTRUCTIONS:

1. Apply $D C$ voltage as shown on schematic. Power source should have maximum ripple of 1 millivolt at 24 V or 2 MV at 48 V in order to attain minimum noise.
2. Connect external capacitors across split transformer winding if shown on schematic.
3. If plugged in horizontally, some extra support should be supplied in addition to socket.
4. When the output and the test jack terminals are loaded with 600 ohms the output signal here will be 11 DB below the main output of the amplifier.

## MAINTENANCE:

No routine maintenance is necessary except to check gain and output as may be required. Normal operating volttages are shown on the schematic. If it becomes necessary to replace the 2 N 1183 control transistor, the accompanying feedback resistor may need reselection to keep the output impedance within desired limits. Its value may vary between 39 K and 130 K in a particular amplifier.

TELEPHONE PRODUCTS DIVISION



SX Simolex Connection


LM Loop Monitor Connection Monitor leads to Socket Terminals


SL Split Loop Connection For External Connection
v.f. repeater amplifiers. telephone
$\qquad$
$\qquad$

SPECIFICATIONS:
Gain: 39 (adjustable 0-39).
Gain Stability: No appreciable variation in gain as voltage varies from low to high values.
Power Capability: +20 DBM with normal distortion. +10 DBM with minimum distortion.
Frequency Response (referred to 1000 cps response): -1 DB at 200 cps and $8 \mathrm{KC} .-3 \mathrm{DB}$ at 100 cps and 15 KC .
Power Required: Nominal 24 VDC models, $20-26 \mathrm{~V}$ at $25-30 \mathrm{ma}$.
Nominal 48 VDC models, 40-52 V at 25-30 ma.
Output Noise Level: 65DB below output at higher value of nominal dc voltage range. ( 48 V ). 75 DB below out-
put at lower value of nominal dc voltage range. ( 24 V ).
Total Distortion Harmonic (at +9 D BM output): $1.0 \%$ at higher value of nominal dc voltage range. ( 48 V ). $1.0 \%$
at lower value of nominal dc voltage range. ( 24 V ).
Input Impedance: $600 / 900 / 1200$ ohms (may be reconnected for 150 ohms loop).
Output Impedance: $600 / 900 / 1200$ ohms (may be reconnected for 150 ohms 100 B ).
Monitor Winding: Test jack output is 11 DB below signal output with outputs loaded with 600 ohms.
Simplex Resistance: 5 ohms input winding, 8 ohms output winding (loop resistances 4 times the above).
Simplex Current: Nax. 100 ma ( 5 ma max, unbalance).
Operating Voltage: TLC315-24 V.
TLC316-48 V.
Surge Protection: This series of V.F. amplifiers maybe ordered equipped with surge protection on input and output by adding the suffix "X'" to the model number - example - TLC316"X'.
Dimensions: $1-5 / 8 \times 1-5 / 8 \times 5-5 / 8$ overall.
Weight: 16 ounces.
Color: Zinc plate with dichromate finish.
Plug: 11 pin, amphenol 86 CP 11.
Monitor Jacks: Accessible from front panel. Also connected to pins 5 and 6 with LM wiring.

## INSTALLATIONS:

1. Make the connections to mounting-socket pins as shown on schematic diagram on reverse side of this page. Observe polarity at supply-voltage pins $8(-)$ and $9(+)$. If polarity is reversed, amplifier will not operate but will not be damaged.
2. To install amplifier, plug it into assigned 11 -pin socket. To remove, use approved extractor tool that fits into flange holes at front of amplifier.

## OPERATION:

The V.F. Repeater amplifier is designed to provide a linear amplification of various input levels depending on the gain control setting. The amplifier will:

1. Provide a maximum output of 10 MW or +10 DBM at the minimum distortion.
2. Provide 39 DB gain without equalization thus giving normal output with an input signal of 25 millivolts.
3. Accept larger input signals without causing distortion if the gain control is turned lower.
4. Have a maximum of $1.0 \%$ distortion at +9 DBM .
5. Will have input and output impedances of $600,900,1200$ ohms $\pm 10 \%$.
6. Offer advantage of compactness and durability associated with transistors and other solid state devices.

## OPERATING INSTRUCTIONS:

1. Apply DC voltage as shown on schematic. Power source should have maximum ripple of 1 millivolt on 24 V models and 2 MV on 48 V models in order to attain minimum noise.
2. Connect external capacitors across split transformer winding as shown on schematic on the SL wiring models.
3. If plugged in horizontally, some extra support should be supplied in addition to socket.
4. When the out put and the test jack terminals are loaded with 600 ohms, the output signal here will be 11 DB below the main output of the amplifier.
5. Different input and output impedances are obtained internally by moving impedance pin to desired jack 6 (600), 9(900), 12(1200).

## MAINTENANCE:

No routine maintenance is necessary except to check gain and output as may be required. Normal operating voltages are shown on the schematic.



Plug End View


## Front Yiew



## GENERAL

The V.F. Repeater amplifier is designed to provide a linear amplification of various input levels depending on the gain control setting. The amplifier will:

1. Provide a maximum output of 10 MW or +10 DBM at the minimum distortion.
2. Provide 40 DB gain without equalization thus giving normal output with an input signal of 25 milli volts.
3. Accept larger input signals without causing distortion if the gain control is turned lower.
4. Provide equalization (if furnished) for a line having a total loss difference of 12.5 DB between 300 cps and 3300 cps signals.
5. Provide equalization that is adjustable by means of a variable resistor. Total line loss plus equalized amplifier gain is constant for various frequencies within a total of 2 DB spread.
6. Have a maximum of $0.5 \%$ distortion at +10 DBM output.
7. Will have input and output impedances of 600 ohms $\pm 10 \% ; 900$ ohm $\pm 10 \%$ and 1200 ohm $\pm 10 \%$.
8. Offer advantage of compactness and durability associated with transistors and other solid state devices.

The amplifier comprises 2 stages having low distortion, good frequency responses, and stable characteristics. On equalized models a variable resistor following the gain control provides a loss circuit which is paralleled by a capacitor. This combination produces a greater series loss at low frequencies than at high and its loss curve is the inverse of a nonloaded cable line. The combined loss of the cable and the equalizer is approximately constant for all frequencies from 300 to 3300 cps .

## SPECIFICATIONS:

gain: 40 d (adjustable 0-40).
gain stability: less than 0.5 DB variation in gain when operating voltage is $24 \pm 4 \mathrm{VDC}$ or $48 \pm 8 \mathrm{VDC}$.
temperature stability: no more than 0.5 DB gain variation from $0^{\circ} \mathrm{C}$. to $+60^{\circ} \mathrm{C}$. free air ambient.
rated power output: + 10 DBM with less than $1 \%$ THD., +18 DBM with less than $5 \%$ THD.
frequency response: (referred to $1,000 \mathrm{cps}$ ); -1 DB 200 cps to $8 \mathrm{KC} .-3 \mathrm{DB} 100 \mathrm{cps}$ to 15 KC .
power required: 20-28 VDC or 40-56 VDC @ 18 ma .
output noise level: 70 DBM.
total harmonic distortion (at +10 DBM output): $0.5 \%$.
input impedance: $600 / 900 / 1200$ ohms $\pm 10 \%$. 150 ohm impedance may be obtained when simplex is not required.
output impedance: $600 / 900 / 1200$ ohms $\pm 10 \%$. 150 ohm impedance may be obtained when simplex is not required.
monitor winding: test jack output is 11 DB below signal output when output is terminated in matched load.
simplex winding: 5 ohms input winding, 8 ohms output winding. (Loop resistance 20 ohms input, 32 ohms output).
simplex current: max. 100 ma ( 5 ma maximum unbalance.)
equalization: Those models so equipped provide equalization for a non-loaded line having a total loss differential of 12.5 DB between 300 cps and 3300 cps signals. This equalization is adjustable between zero and maximum so that total line loss plus equalized amplifier gai n is constant for various frequencies within a total of 2 DB spread.
surge protection: this series of V.F. amplifiers may be ordered equipped with surge protection on input and output by adding the suffix " X " to the model number - example - TLC3 17 " X ".
dimensions: $1-5 / 8 \times 1-5 / 8 \times 5-5 / 8$ overall.
weight: 16 ounces.
color: zinc plate with dichromate finish.
plug: 11 pin, amphenol 86CP11.
monitor jacks: accessible from front panel. Also connected to pins 5 and 6 when LM wiring models are specified.

## OPERATING INSTRUCTIONS:

1. Select input and output impedance by moving jumper to proper pin on circuit board. Impedances are marked on circuit board as 6-9-12. (for 600, 900 and 1200 ohms). Factory strapped for 600 ohms.
2. Apply DC voltage as shown on schematic. Power source should have maximum ripple of 1 millivolt on 24 V models and 2 MV on 48 V models in order to attain minimum noise.
3. Connect external capacitors across split transformer winding as shown on schematic on the SL wiring models.
4. If plugged in horizontally, some extra support should be supplied in addition to socket.
5. When the output and the test jack terminals are loaded with 600 ohms, the output signal at the monitor jacks will be 11 DB below the main output of the amplifier.
6. For a $100 \%$ line the equalizer loss will vary from $2-3 \mathrm{DB}$ at 3300 cps to $12.5-13.5 \mathrm{DB}$ at 300 cps . The equal control should be set to provide this 300 cps loss and the 3300 cps value checked. The difference between the low and high frequency losses should be 10.5 DB. For other length lines the 3300 cps loss should be the same $\%$ of 10.5 DB . The maximum length is a $120 \%$ line. After the equal control is set, the locking nut should be tightened to preserve this setting.

## INSTALLATION:

1. Make the connections to mounting-socket pins as shown in schematic diagram on this page. Observe polarity at supply-voltage pins $8(-)$ and $9(+)$. If polarity is reversed, amplifier will not operate but will not be damaged.
2. Tighten voltage selection screw in bottom for 24 V operation. Remove for 48 V operation.

Note: The voltage screw is factory adjusted for 48 Volt operation.
3. To install amplifier, plug it into assigned 11-pin socket. To remove, use approved extractor tool that fits into flange holes at front of amplifier.

MAINTENANCE:
No routine maintenance is necessary except to check gain and output as may be required. Normal operating voltages are shown on the schematic.



| $\begin{aligned} & \text { MODEL } \\ & \text { NUMBER } \end{aligned}$ $\begin{gathered} \text { NUMBE } \\ \text { TLC } \end{gathered}$ |  |
| :---: | :---: |
| 401 | 5x |
| 0 ： | S 1 |

SLNENOdWOD ヨNIT ヨNOHdヨTヨ1


| MODEL <br> NUMBER <br> TLC | WIRING <br> CONNECTIONS |
| :---: | :---: |
| 402 | SX |
| 406 | SL |

## FUNCTION:

The TLC500 Series of microphone pre-amplifiers are designed for special applications where it is desirable to use low impedance microphones to drive a 600 ohm telephone line or high power amplifier.

The TLC501, TLC503 and TLC505 are designed for driving telephone lines. The TLC502 and TLC504 are for driving power amplifiers having a 50,000 ohm or higher input impedance.

This series of three (3) stage transistor amplifier functions as combined pre-amplifier and line amplifier.

## SPECIFICATIONS:

## Gain:

Gain Stability:
Power Output:
Frequency Response:
D.C. Power Required:

Output Noise Level:
Total Harmonic Distortion:
Input Impedance:
Output Impedance:
Simplex Resistance:
Simplex Current:
Dimensions:
Weight:
60 db (adjustable 0-60)
No appreciable variation in gain as voltage varies from low to high values.
0 dbm rated; +15 dbm max.
(Referred to 1000 cps ) $200-3300 \mathrm{cps} \pm 1.0 \mathrm{db}$.
$100-8000 \mathrm{cps} \pm 3.0 \mathrm{db}$.
TLC501, TLC502 and TLC505 24VDC nominal e 30 MA ( 15 MA at 12 VDC minimum) TLC503 and TLC504 48VDC nominal @ 30 MA ( 15 MA at 24 VDC )
TLC501, TLC502 and TLC505; -50 dbm @ 24VDC; TLC503 and TLC$504 ;-50 \mathrm{dbm}$ ® 48 VDC .
(at 0 dbm output with nominal operating D.C. voltage)
$3 \mathrm{mn}-320 \mathrm{cns}-1 \%$
50,150 or 250 ohms. Ralanced, selectable on mounting socket.
TLC501, TLC503 and TLC505; 600 ohms $\pm 10 \%$ TLC5 2 and TLC504; 50,000 ohms.
(Output Winding Only) TLC501 and TLC503-50 ohms loop resistance 200 ohms.
Max. 100 MA ( 5 MA max. unbalance)
$1-5 / 8^{\prime \prime} \times 1-5 / 8^{\prime \prime} \times 5-5 / 8^{\prime \prime}$ overall.
16 ounces.
Color: $\quad$ Zinc plate with dichromate finish.
Plug:
Monitor Jacks:
11 pin amphenol 86 CP 11.
Accessible from front panel (Jacks bridge output).

## INSTALLATION:

1. Make the connections to mounting-socket pins as shown on schematic diagram on reverse side of this page. Observe polarity at supply-voltage pins $8(-)$ and $9(+)$. If polarity is reversed, amplifier will not operate but will not be damaged.
2. To install amplifier, plug it into assigned 11 -pin socket. To remove, use approved extractor tool that fits into flange holes at front of amplifier.

## OPERATING INSTRUCTIONS:

1. Connect two (2) conductor shielded LO $Z$ microphone cable to:

Pin 1 and 10 for 50 ohm microphones
Pin 1 and 5 for 150 ohm microphones
Pin 1 and 2 for 250 ohm microphones
Shield to ground (Pin 11)
2. Apply DC voltage as shown on schematic. Power source should have maximum ripple of 1 millivolt on 24 V models and 2 MV on 48 V models to attain minimum noise levels.
3. Connect external capacitors across split windings on models having SL connection as shown on schematic.
4. If plugged in horizontally, some extra support other than socket should be supplied.

## MAINTENANCE:

No routine maintenance is necessary except to check gain and output as may be required. Normal operaing voltages are shown on the schematic for internal test points.



## FUNCTION：

These bridging amplifiers are designed to drive monitoring headsets from hot line networks with negligible insertion loss．

The amplifier comprises three stages having low distortion，good frequency responses and，stable characteristics． On equalized models，a variable resistor following the first stage provides a loss circuit which is paralleled by a capacitor．This combination produces a greater series loss at low frequencies than at high frequencies，and its loss curve is the inverse of a non－loaded cable line．The combined loss of the cable and the equalizer is approx－ imately constant for all frequencies from 300 to 3300 CPS．

## THE AMPLIFIERS WILL：

1．Provide a maximum output of 10 MW or +10 DBM at minimum distortion．
2．Provide 50 DB gain without equalization thus giving normal output with an input signal of 25 MV ．
3．Accept larger input signals without causing distortion if gain control is turned lower．
4．Provide equalization that is adjustable by means of a variable resistor．Total line loss plus equalizedamplifier gain is constant for various frequencies within a total of 2 DB spread．
5．Have a minimum of $1.5 \%$ distortion at +10 DBM output．
6．Will have input impedance of 120 K ohms and output impedance of 150 ohms $\pm 10 \%$ ．
7．Offer the advantage of compactness and durability of solid state circuitry．

## INSTALLATION：

1．Make the connections to mounting socket pins as shown in schematic diagram on reverse side．Observe polarity at supply voltage pin $8(-)$ and $9(+)$ ．If polarity is reversed，amplifier will not operate，but will not be damaged．
2．To install amplifier，plug into its assigned 11 pin socket．To remove use approved extractor tool（TLC914）．
3．If plugged in horizontally，some extra support，other than the socket should be supplied．
4．Connect external capacitors across split transformer winding as shown on schematic for the SL wiring models．

## EQUALIZER OPERATION：

For a $100 \%$ line，the equalizer loss will vary from $2-3 \mathrm{DB}$ at 3300 CPS to 10.5 DB at 300 CPS ．The equal control should be set to provide this 300 CPS loss and the 3300 CPS value checked．The difference between the low and high frequency losses should be 10.5 DB ．For other length lines the 3300 CPS loss should be the same $\%$ of 10.5 DB．The maximum length is a $120 \%$ line．After the equal control is set，the locking nut should be tightened to preserve this setting．

## MAINTENANCE：

No routine maintenance is necessary except to check gain and output as required．Normal operating voltages are shown on the schematic．

## SPECIFICATIONS：

Input Impedance：
Output Impedance：
Output Noise Level：
Frequency Response：
Gain：
Gain Stability：
Total Harmonic Distortion：
（ +10 DBM output）
Power Capability：
Simplex Resistance：
Simplex Current：
Power required：
Equalization：

Controls：
Monitor Jacks：
Monitor Windings：
Dimensions：
Weight：
Color：
Plug：

120 K ohms．
150 ohms．
60 DB below output at higher value of nominal voltage range（ 26 and 52 V ）． $1 \%$ Referred to 1000 CPS response．
50 DB（Adjustable 0－50）
No appreciable variation in gain as voltage varies from low to high values．
$0.5 \%$ at higher value of nominal do voltage range（ 26 and 52 V ）． $1.0 \%$ at lower value of nominal dc voltage range（ 12 and 24 V ）．
+20 DBM with normal distortion，+10 DBM with minimum distortion．
400 ohms．
Maximum 100 ma － 5 ma maximum，Inbalance when using simplex connection．
Nominal 24 VDC models， $12-26 \mathrm{~V}$ at $15-30 \mathrm{ma}$ ．
Nominal 48 VDC models， $24-52 \mathrm{~V}$ at $15-30 \mathrm{ma}$ ．
Models so equipped provide equalization for a non－loaded line having a total loss differential of 10.5 DB between 300 CPS and 3300 CPS signals．Equalization is adjustable from 0 to maximum so that total line loss plus equalized amplifier gain is constant for various frequencies within a total of 2DB spread．
Gain and Equal．Gain remote on TLC601．
Located on front panel．
Test jack output bridges output windings．
$1-5 / 8$＇＂$\times 1-5 / 8$＂$\times 5-5 / 8$＇overall．
16 ounces．
Zinc plate with dichromate finish．
11 pin．（Amphenol 86CP11）．


Plug End View


Front View

NOTE 1

$$
\begin{aligned}
& \begin{array}{l}
\text { FOR GOON INPUT-CONECT AS SHOWN. } \\
\text { FOR } 150 \cap \text { INPUT. USE ETTHER SLOR SX } \\
\text { WIANG ANO CONNECT TO } \\
\text { IAND } 10
\end{array} \\
& \begin{array}{l}
\text { AL OL VOLTAGES ARE WITH RESPECT TO } 0 \text { VOLTS } \\
\text { USE } 20.000 \text { OHM PER VOLT METER }
\end{array} \\
& \begin{array}{l}
\text { USE } 20.000 \text { OAH PER VOLT METER I } \\
\text { VOLTAGES OBTAINED WHEN EREF IS }-24 \text { VOC }
\end{array}
\end{aligned}
$$

$$
\begin{aligned}
& \begin{array}{l}
\text { NOTE } 4 \text { SWISE SPECIFIED } \\
\text { CRI SILCON RECTIFIER } \\
750 \mathrm{MA} \text { IOOPIV }
\end{array}
\end{aligned}
$$

| $\begin{array}{\|c\|} \hline \text { MODEL } \\ \text { NUMBER } \\ \text { TLC } \end{array}$ | SOURCE VDC (NOM) | $\left\{\begin{array}{c} \text { OE-COUPLING } \\ \text { RESISTOR } \\ \text { RI8 } \end{array}\right.$ | $\begin{gathered} \text { WIRING } \\ \text { CONECTIONS } \\ \text { INPUTT } \end{gathered}$ |
| :---: | :---: | :---: | :---: |
| 601 | 24 | $10 \sim 1 / 2 \mathrm{w}$ | SL |
| 606 | 48 | 820n 2 w | SL |
| 607 | 24 | $110 \sim 1 / 2 w$ | 5x |
| 608 | 48 | 820 ~ 2 w | 5x |



GOR G00^ INPUT-CONNECT AS SHOWN.
FOR $150 \wedge$ INPUT-USE EITHER SLOR SX
WIRING AND CONNECT TO
 ALL DC VOLTAGES ARE WITH RESPECT TO O VOL
USE 20.000 OHM PER VOLT METER
VOGTAGES OBTAINED
 NOTE 4 I SILICON RECTIFIER
750 MA 100 PIV

| MODEL number TLC | POWER SOURCE VDC (NOM) | $\begin{array}{\|c\|} \hline \text { OE-COUPLING } \\ \text { RESISTOR } \\ \text { R18 } \end{array}$ | WIRING CONNECTIONS (INPUT) (INPUT) |
| :---: | :---: | :---: | :---: |
| 602 | 24 | $10 \sim 1 / 2 \mathrm{~W}$ | SL |
| 603 | 48 | 820n 2 w | SL |
| 604 | 24 | 10~ $1 / 2 \mathrm{w}$ | sx |
| 605 | 48 | 820~~ 2 w | sx |



## COMMUNICATIONS <br> TLC 701 terminating set

$\qquad$


## TLC701 Terminating Set

The TLC701 terminating set is a plug-in unit designed for use in Webster Electric 2-4 wire terminating systems.

The TLC701 terminating set is completely wired. It contains the hybrid coils, signal bypass capacitors, two (2) selectable compromise networks ( 600 or 900 ohm in series with 2.0 mfd .) and simplex inductor. The front panel mounted S2 switch permits selection of the proper hybrid coil impedance ratio for operation from 600 or 900 ohm drops to assure a maximum return loss factor. The selection of the 600 or 900 ohm compromise networks, simplex inductors and strapping of the B \& D leads are by means of front panel mounted screw type switches.

Internally two (2) 1.0 mfd . capacitors are available for the signal bypass circuit. Normally one of the capacitors is factory wired. When the cover of the TLC701 is removed a simple strapping arrangement allows the second 1.0 mfd . capacitor to be paralleled with the factory wired capacitor to provide 2.0 mfd . when required in the signal bypass circuit. Additionally two (2) 1.0 mfd . capacitors are provided in the hybrid balance network to offset the capacitance in the signal bypass circuit, and maybe strapped into the circuit as required.

The $\mathrm{A}, \mathrm{B}, \mathrm{D}, \mathrm{F}$ and G leads are extended to the 20 pin connector of the TLC701 term set. Leads for connection to external balancing networks are also extended to the unit connector and are wired through the mating connector of Webster Electric term set mounting shelves to an appropriate socket for use with Webster Electric plugin balancing networks.

The internal compromise networks may be used in conjunction with the TLC851 NBOC unit when
build out capacitance is required.
TLC701 specifications:
IMPEDANCE:
2 Wire Impedance: 600 or 900 ohm selectable by operation of front panel mounted S2 switch.
4 Wire Impedance: 600 or 900 ohm when required.
Internal Compromise Net: 2.0 mfd in series with either 600 or 900 ohm resistors selectable by operation of S 3 switch. ( 900 ohm ) or S4 switch ( 600 ohm ).
Hybrid Insertion Loss: Transmit circuit 4 db approx. Receive circuit 4 db approx. 200-6000 cps.

## TRANS-HYBRID LOSS

(with 600 ohms in series with 2.0 mfd 2 wire termination)

| $200-1,000 \mathrm{cps}$ at least | 70 db |
| :--- | :--- |
| $2,000 \mathrm{cps}$ | 64 db |
| $3,000 \mathrm{cps}$ | 60 db |
| $4,000 \mathrm{cps}$ | 58 db |

(with 900 ohms in series with 2.0 mfd 2 wire termination)

$$
\begin{array}{ll}
200-1,000 \mathrm{cps} \text { at least } & 65 \mathrm{db} \\
2,000 \mathrm{cps} & 58 \mathrm{db} \\
3,000 \mathrm{cps} & 52 \mathrm{db} \\
4,000 \mathrm{cps} & 50 \mathrm{db}
\end{array}
$$

## RETURN LOSS

(when properly terminated)
$300-4,000 \mathrm{cps}$ greater than 30 db
Longitudinal Balance - 200-4,000 cps greater than 60 db
Frequency Response - Designed for 200-4,000 cps Voice Band $\pm 1 \mathrm{db}$.
Maximum Operating Level - +18 dbm .
Current Capacity-Signal Winding - 150 ma.

## RETURN LOSS (Continued)

Maximum out of Balance Current in Signal Winding: - 100 ma .
Dimensions - . . . - 3-3/8'' wide x 1-5/8'' high x 6-31/32'" deep, excluding plug.
Weight - - - - . - - 1 lb. Approximately
Color - . . . . . .-. Zinc plate with Dichromate finish.
Plug - . . . . . . . - 20 pin Cinch Jones 213-20-00-116 to mate with 211-20-01-031

FRONT PANEL CONTROLS - 6 (1 rotary, 5 screw type switches)

## Switch Function:

S1 - Strapps D and B leads - normally operated.
S2 - Selects hybrid coil ratio; Position 1 pro-
vides 900 ohm drop impedance and 600 ohm 4 wire impedance when 900 ohm COMP NET switch (S3) is operated. Position 2provides 600 ohm drop impedance and 600 ohm 4 wire impedance when 600 ohm COMP NET switch (S4) is operated.

When 900 ohm drop and 900 ohm 4 wire impedances are required select position 2 and operate 900 ohm COMP NET switch (S3).
S3 - Selects 900 ohm compromise network.
S4 - Selects 600 ohm compromise network.
S5 and S6 are simplex inductor shorting switches; when operated simplex inductors are shorted.
NOTE: The 6th screw type switch is not wired and is for special service wiring when required



The TLC731 4 －wire terminating unit is designed to allow quick，dependable and uncomplicated conversion of 4 －wire VF telephone circuits to 2 － wire facilities．Particularly suited for VF exten－ sion of 4 －wire carrier derived facilities and PBX tie line service，the TLC731 unit provides ver－ satility and simplicity required to meet modern transmission objectives．Designed to accept a wide array of＂plug－in＂components the TLC731 unit allows use of variable balancing networks， filters，attenuators，equalizers and VF amplifiers． A jack field，containing 13 jacks，allows ready access to all points in the circuit for routine testing and circuit alignment．

Designed for mounting in a $19^{\prime \prime}$ rack，the TLC－ 731 unit requires $1-3 / 4^{\prime \prime}$ of panel space and measures $8-1 / 2$＂front to back，fully comple－ mented．

The completely wired TLC731 shelf assembly provides E \＆M signalling extension through the jack field for testing and extends the A，B，D， F，G and simplex leads of the plug－in TLC701 term set to the screw type terminal board on the rear of the shelf．

The TLC731 shelf assembly includes no p1ug－ in units except for two（2）dummy wired plugs for insertion in sockets where no plug－in unit is required．

The following block diagram shows the socket line up of the TLC731 shelf and typical plug－in units used．


A typical fully complimented system would be as follows：
1．TLC731 Shelf equipped with
1 TLC701 Term Set
2 TLC811 Pad adaptors－appropriate
WE Co 89 type resistors
2 TLC300 Series Amplifiers
（TLC301 for 24 V system，TLC304 for 48 V system）
1 TLC851 NBOC
The TLC811 pad adaptors are equal to the W．E．Co．1C pad adaptor and will accept W．E． Co． 89 type resistors．The TLC811 pad adaptor may be replaced with a TLC813 variable（0－25 db in 5 db steps）attenuator，the TE1284 attenu－ ator（ $0-40 \mathrm{db}$ in 1 db steps），the TLC801 adjust－ able equalizer，or the TLC866 filter（ $0-2850 \mathrm{cps}$ ）．

The TLC300 series V．F．amplifiers are nor－ mally plugged into sockets 4 and 5 ，and signal－ ling is derived from the C．T．of the amplifiers． However，the amplifiers can be plugged into sockets 3 and 6 if desired．Attenuator，filters etc．，may be used in socket 4 and 5 and signalling bypassed．（See signalling section）．

The TLC851 NBOC（net build out capacitors） may be replaced with precision or compromise balance networks to meet various cable or open wire facilities（See network section）．

The TLC701 term set is a plug in unit which contains the HYBRID coils and signal bypass capacitors，basic compromise network which con－ sists of a 2.0 mfd capacitor in series with a 600 or 900 ohm precision resistor which are selec－ table by operation of the S3 or S4 switch，to allow a 600 or 900 ohm balance to be obtained against the 2 －wire drop circuit．The 600 or 900 ohm impedance of the HYBRID COILS is select－ ed by operation of the S2 switch．Simplex in－ ductors are an integral part of the TLC701 and inductor shorting switches are accessible on the front panel．


## SIGNALLING SECTION

In the design of the TLC731 4-wire terminating unit and the TLC701 term set, Webster Electric Company provides simplicity and versatility in deriving signal circuits.
$E$ and $M$ signalling circuits are easily obtained to meet most requirements. Bypass signal circuits are easily obtained by simple strapping on the screw type terminal strip mounted on the rear of the TLC731 unit. This silk screened terminal strip features ready identification of all signal circuit leads.

The A, B, D, F and G leads of the TLC 701 term set are extended to the terminal board of the TLC731 and are clearly marked as are the A1, B1 leads from the "MOD IN", and the A2, B2 leads from the "DE-MOD OUT" circuits. Two (2) jacks in the jack field of the TLC731 unit are labeled " $E$ \& $M$ ". One jack is identified as "LINE" and the other as "EQUIPMENT". The purpose of the two (2) jacks is to provide routine test points for the " $E \& M$ " signalling system.

The jack identified as "LINE" extendsthe " $E$ " and " $M$ " leads to the terminal board and are available for strapping to the appropriate "A1" or "A2" leads of the 4 -wire circuit. The jack, when operated by insertion of a standard $1 / 4^{\prime \prime}$ three circuit ( $T, R$ and S) plug, opens the signal leads from the signal set and isolates the signal leads on the 4 -wire side for testing.

Thejack identified as "EQUIP"' breaks the circuit of the 4 -wire side and allows testing through the signalling set, and the "A \& B" leads to the 2 -wire drop side of the circuit. The leads from the "EQUIP" jack are extended to the terminal board and are identified as "E1". and "M1".

The F, G and D (S1) leads are for use in PBX tie line or trunk facilities in accordance with Western Electric practices.

The drawing below shows wiring details of the signalling circuit arrangement of the TLC731 and TLC701 units. The dashed (---) lines show installer furnished wiring.

Note that two (2) 1.0 mfd capacitors are shown
in the split winding of the hybrid coils where the $\mathrm{A}, \mathrm{B}$ and D leads are derived, also that the balance windings have two (2) 1.0 mfd capacitors. By strapping E1 to E2, and E3 to E4, internally in the TLC 701 term set, 2.0 mfd may be introduced in the signalling circuit. It is necessary, if 2.0 mfd blocking is used in the signal circuit, that 2.0 mfd be used in the balance circuit. Strapping of E1 to E2, and E3 to E4 assures proper balance. IF THE BALANCE CIRCUIT CAPACITANCE IS NOT EQUAL TO THE SIGNAL CAPACITANCE, POOR TERMINAL BALANCE WILL RESULT.

J4 and J5 are the sockets that mount the plugin amplifiers or transformers which terminate the 4 -wire circuit. If amplifiers or transformers having C. T. windings are used, the C. T. becomes the A1 and A2 leads and may be used to derive signalling. If split loop amplifiers or transformers are used in J4 and J5, A1 must be strapped to $\mathrm{B} 1, \mathrm{~A} 2$ to B 2 , or capacitors may be used for D. C. blocking in special signal arrangements. If capacitors are used in the A1-B1, and A2-B2 circuit, care must be exercised to assure balancing in TLC701 circuit. Two (2) terminals labeled XB are supplied on the TLC731 rear terminal strip, and may be used to add capacitance if required to balance the signal capacitance.

If separate signalling facilities are derived from carrier terminals, the $E \& M$ leads from such systems may be extended directly to the "E \& M' terminals of the TLC731 (if test facility is desired), or directly to the signalling set, then to the "A \& B" leads for drop signalling.

The TLC701 term set includes simplex inductors which may be used if desired. Simplex inductor shorting switches are mounted on the front panel and short the inductors when activated (full clockwise).

The input leads SX and SX1, and output leads A3 and B3 are extended to the terminal strip of the TLC731 unit for easy access.

The simplex inductors may be strapped into the circuit as required. If not used, simply bypass wiring around the inductors and disregard them as circuit elements.

All capacitors shown are 1.0 mfd .
If amplifiers having SL (split loop) windings are installed use Al and A2 for signal bypass.
If amplifiers have SL (split loop) windings are installed, derive simplex function by strapping A1-B1, and A2-B2.
Capacitors may be added between A1-B1 and A2-B2 when required for other signalling requirements.
Dashed wiring is installer wired.




## Description

The TLC732 4 -wire repeater terminating unit is designed to allow quick, dependable and uncomplicated conversion of 4 -wire V.F. telephone circuits to 2 -wire facilities.

Mounted in its own equipment box this fully wired unit is suitable for wall mounting on customer location, or wherever a simple $2-4$ wire, self-contained, terminating repeater is required.

The basic unit is completely wired and is equipped with the hybrid coils, a strappable compromise balancing network, ( 600 or 900 ohms in series with 2.0 mfd .) sockets for plugging in the optional V.F. amplifiers, idle termination relay, and mounting facilities for the power supply. Two (2) dummy plugs are furnished for insertion in the amplifier sockets when V.F. amplifiers are not required.

Signal bypass circuits may be derived at the line side of the 4 -wire circuit when V.F. amplifiers are used by means of the center taps on the amplifiers. The A \& B leads of the hybrid coils are extended to the screw type terminal strip.

The 2-wire drop impedance is established at the factory as 900 ohms, but may be converted to 600 ohms by simple strapping in the field.

The 4 -wire circuit impedances of the hybrid are 600 ohm as shipped to match the TLC300 series amplifier impedances. Simple strapping in the field permits 900 ohm operation of the 4 -wire branches of the hybrid when required.

The above mentioned strapping is accomplished on a strapping board which is part of the basic unit.

All connections to the TLC732 terminating unit are made to a screw type terminal strip.

A typical fully complimented system would be as follows:

1. TLC732 Terminating Unit
2. TLC300 Series Amplifiers (TLC317 - TLC322)
3. TLC100 Series Power Supply (TLC101 for $24 v$ operation, TLC106 for $48 v$ operation)
4. TLC881 Idle Circuit Termination Relay

## Technical Information

The TLC732 is a self-contained 2 -wire to 4 -wire terminating unit. The chassis serves as a base for wall mounting the unit. The cover completely encloses the unit for unobtrusive installation.

The chassis is completely wired and contains the assembled hybrid coils, compromise networks, signal bypass, strapping field, sockets for the V.F. amplifiers and idle circuit termination relay (disabling) mounting for the power supply, and a screw type terminal strip for line connections.

Selection of a 900 ohm or 600 ohm drop (2-wire) impedance and compromise network is shown under installation.

Idle circuit termination (disabling) is accomplished by relay contacts shorting the transmit branch of the 4 -wire circuit prior to the transmit amplifier. The coil leads of the relay are extended to the terminal strip to permit adaptation to local circuit requirements.

A 2.0 mfd capacitor is inserted between the "A" and "B" lead connections to the hybrid for signal bypassing. The balance network has a 2.0 mfd capacitor wired into its circuit to offset the signal capacitance. If the signal bypass capacitor is strapped out, the offsetting capacitor in the balance network must also be strapped out.

## Specifications

TRANS-HYBRID LOSS: (with 600 ohms in series with 2.0 mfd 2 -wire termination)

| $200-1000 \mathrm{cps}$ at least | 70 db |
| :--- | :--- |
| $2,000 \mathrm{cps}$ | 64.0 db |
| $3,000 \mathrm{cps}$ | 60 db |
| $4,000 \mathrm{cps}$ | 58.0 db |

(with 900 ohms in series with 2.0 mfd 2 -wire termination)

| $200-1000 \mathrm{cps}$ at least | 65 db |
| :--- | :--- |
| $2,000 \mathrm{cps}$ | 58 db |
| $3,000 \mathrm{cps}$ | 52 db |
| $4,000 \mathrm{cps}$ | 50 db |

RETURN LOSS: (when properly terminated) 300$4,000 \mathrm{cps}$ greater than 30 db

Longitudinal Balance: 200-4,000 cps - greater than 60 db .


Frequency Response: Designed for $200-4,000 \mathrm{cps}$ Voice Band $\pm 1 \mathrm{db}$.

Maximum Operating Level: +16 dbm .
Current Capacity Signal Winding: 150 ma .
Maximum Out of Balance Current in Signal Winding: 100 ma .

## Installation

Unpack TLC732 unit and inspect for concealed shipping damage. If damage is observed, file damage report with carrier and return to Webster Electric Company or Graybar Electric Company for repair or replacement.

If TLC300 series V.F. amplifiers are to be used the 4 -wire branch impedances must be strapped for 600 ohms. The 2 -wire (drop) impedance may be 600 or 900 ohms.

Normal usage shows that 900 ohm 2-wire impedance is most common. Therefore, Webster Electric Company has pre-strapped and tested each TLC732 for 900 ohm 2 -wire and 600 ohm 4 -wire operation.

When amplifiers are not used plug-in line transformers are available to match various 4 -wire impedances and will directly replace the V.F. amplifiers. If amplifiers are not used, transformers must be used if signalling circuits are to be derived.

To establish hybrid impedances strap as in below tables.

2-wire (drop) 900 ohms (factory setting)
4 -wire branches 600 ohms (factory setting)

## Strap As Below

E8 to E7
E2 to E3
E5 to E4
E11 to E12
E14 to E13

2-wiṛe (drop) 600 ohms
4 -wire branches 600 ohms

## Strap As Below

E8 to E9
E2 to E1
E5 to E6
E11 to E10
E14 to E15
2-wire (drop) 900 ohms
4 -wire branches 900 ohms

## Strap As Below <br> E8 to E7 <br> E2 to E1 <br> E5 to E6 <br> E11 to E10 <br> E14 to E15

After proper hybrid impedances have been selected, mount TLC101 or 106 power supply on lower chassis plate by means of two (2) $6 / 32 \times 13 / 4$ ', screws through power supply into chassis. Connect WHITE power supply pigtail to -24 or 48 VDC terminal, RED pigtail to +24 or 48 VDC terminal on screw type strip.
NOTE: If local battery or battery eliminator is used only such supplies having a low ripple voltage should be used. The TLC101 and 106 ripple voltage is less than 3 mv (rms) at full load.

Insert transmit amplifier in socket adjacent to power supply marked "TX Amp". Insert receive amplifier in socket marked 'RCV Amp'". Insert idle circuit relay in socket marked "Relay".

Mount unit chassis by means of mounting holes in chassis flanges.

Connect circuit wiring to screw type terminal strip as shown on schematic.

Adjust gain of amplifiers as required to maintain levels.

Idle circuit termination (disabling) relay will operate on 24 or 48 VDC. Control circuit wiring is local option to meet circuit operate requirements.



## Description

The Webster Electric TLC736 4 wire repeater mounting shelf is designed to facilitate conversion of 4 wire telephone circuits to 2 wire facilities. As used in the Webster Electric 736 repeater system it provides services equivalent to the Western Electric Company's 24V4B systems.

The flexibility to increase the use of the 736 system to equal the larger 737 system is provided by the TLC916 mounting plate. By using the TLC916 mounting plate idle line terminating relays, filters or other auxiliary equipment may be added to the 736 system at any time.

The mounting shelf is wired to accept a wide array of Webster Electric plug-in modules facilitating quick and simple assembly of various repeater requirements. It consists of five (5) wired sockets, a test and monitor jack field consisting of ten (10) jacks and a screw type (or optional wire-wrap) terminal board located on the rear panel.

The TLC736 repeater mounting shelf is designed for KTU (key telephone unit) mountings and measures $7-7 / 8^{\prime \prime}$ deep, $5-5 / 16^{\prime \prime}$ wide by $7^{\prime \prime}$ high including mounting flanges.

## Technical Information

The TLC736 repeater mounting shelf is completely wired and ready to accept the various plug-in components to obtain the various arrangements of repeaters normally required. Special wiring can be obtained from the Factory when required to meet special applications.

The Jack field consists of ten (10) standard $1 / 4^{\prime \prime}$ jacks wired in pairs. One jack is for monitoring only, the other is a cut out jack for insertion of test equipment. The function of each pair of jacks is clearly indicated schematically on the front panel jack field. The jack field operation is shown in the chart on Page 4.

## Signal Leads

J1 socket extends the $\mathrm{A}, \mathrm{B}, \mathrm{D}(\mathrm{S} 1), \mathrm{F}, \mathrm{G}, \mathrm{A} 3$ (A1), B3 (B1) and SX leads to the terminal board for various signaling requirements. Additionally, terminals for "E" type or SS-1 signaling, are provided.

For full wiring information consult Schematics 219-40000 and TE1384-3.

## Application Information

Drawings TE1384-1 and TE1384-2 have been produced only for aid in cross referencing Webster Electric TLC equipment to Western Electric equipment used in 24V4 repeaters. Drawing TE1384-1 is similar to Bell Laboratories' drawing SD-97047-01-13 and shows the Webster Electric equipment that would be used to provide identical service in a 24V4 application. Drawing TE1384-2 is similar to figures 106 and 107 of Bell Laboratories' drawing SD-97047-01-14 and figure 115 of Bell Laboratories' drawing SD-97047-01-16. These two (2) drawings are to be found in the section entitled 736 and 737 Systems, under REPEATER TERMINATING UNITS in your Webster Electric Telephone catalog.


## 2 Wire

Mon.(J7) - Monitors 2 wire circuit
Hyb. in (J16) - Cuts out 2 wire drop and provides access to 2 wire circuit of hybrid To cut out hybrid and test 2 wire facility insert dummy plug into hybrid in (J16) and insert test plug in mon (J7) jack.
Amplifier Input Transmit Pair
Mon (J8) - Monitors output of hybrid transmit leg and amplifier input
In (J9) - Cuts out hybrid transmit leg and provides access to amplifier input
To cut out amplifier input and test hybrid transmit leg, insert dummy plug into In (J9) jack and insert test plug in Mon (J8) jack.
Amplifier Output Transmit Pair
Out (J10) - Cuts out transmit pair of 4 wire facility and provides access to amplifier output
Mon ( J 1 l ) - Monitors output of amplifier and transmit pair of 4 wire facility
To cut out amplifier output and test transmit pair of 4 wire facility insert dummy plug into Out jack (J10) and insert test plug into Mon (J11) jack.
Amplifier Input Receive Pair
Mon (J12) - Monitors receive pair of 4 wire facility and amplifier input
In (J13) - Cuts out receive pair of 4 wire facility and provides access to amplifier input To cut out amplifier input and test receive pair of 4 wire facility insert dummy plug into In (J13) jack and insert test plug into Mon (J12).
Amplifier Output Receive Pair
Out (J14) - Cuts out input to hybrid receive leg and provides access to amplifier output
Mon (J15) - Monitors output of amplifier and input to receive leg of hybrid
To cut out amplifier output and test receive leg of hybrid insert dummy plug into Out (J14) jack and insert test plug in Mon (J13) jack.

Sockets J1 through J5 are wired for plug-in components as indicated in the following chart.

| Socket | Type | Wired For | Socket | Type | Wired For |
| :---: | :---: | :---: | :---: | :---: | :---: |
| J1 | 20 Pin | TLC701 term set | J3 | 11 Pin | TLC802 Equalizer |
| J2 | 11 Pin | TLC851 NBOC <br> TLC852 Precision network unloaded cable |  |  | TLC834 Transformer assembly TLC892 Strap through assembly |
|  |  | H88 loaded cable <br> TLC854 Precision network open wire TLC855 Adjustable compromise network | $\begin{gathered} \mathrm{J} 4 \\ \text { and } \\ \mathrm{J} 5 \end{gathered}$ | 11 Pin | TLC300 Series VF amplifier TLC835 1C pad adaptor with transformer <br> TLC811 1C pad adaptor TLC891 Strap through |

The TE1377B idle circuit relay may be used with the 736 system. This use requires a'TLC916 mounting plate as a companion shelf to the TLC736 repeater shelf. See Drawing TE1384-3


Webster Electric Co. has designed the 736 and 737 Systems to provide functional equivalents to the Western Electric 24V4A, 24V4B and 24V4C.

The WECO 24V4A and 24V4C Systems are designed for mounting in $19^{\prime \prime}$ or $23^{\prime \prime}$ bays. The basic difference between the units consists of the addition of two (2) sockets to the 24V4C. The two (2) sockets are for addition of a precision network and a low pass filter. The addition of these two (2) sockets requires a new shelf (J98615BJ), and a 23 '' mounting. A wired plug is furnished for use when the filter or precision network is not used.

THE WEBSTER ELECTRIC 737 SYSTEM PROVIDES THE FEATURES OF THE 24V4C AND STRAP THRU PLUG-IN UNITS PROVIDE THE FEATURES OF THE 24V4A.

The WECO 24V4B provides the same services as the 24 V 4 A but is arranged for mounting in keyunit apparatus mountings such as the WECO 16C or 31 A . It is more flexible than the 24 V 4 A due to a more versatile terminal board providing more
strapping options.
THE WEBSTER ELECTRIC 736 SYSTEM IS DESIGNED TO PROVIDE THE FUNCTIONAL FEATURES OF THE WECO 24V4B AND IS ARRANGED FOR KEY-UNIT MOUNTING.

By use of the TLC916 Apparatus Mounting Plate Assembly, an idle circuit relay and/or TLC867 low-pass filter may be used. This brings the 736 System capability to the equal of the 737 System or WECO 24V4C.

Drawings TE1384-1 and TE1384-2 are systems functional blocks and are similar to Bell Laboratories drawings SD-97047-01-13, Fig. 102-105; SD-97047-01-14, Fig. 106 and 107; and SD-97047-01-16, Fig. 115. These drawings are strictly for aid in systems design and for use in cross referencing Webster Electric Equipment to Western Electric's to provide equivalent service.

The most common arrangements of the Webster 736 and 737 Terminating Repeater Systems equivalent to the WECO 24V4A, B and C are shown in the following chart.

NOTE: Fig. numbers are the same on Bell Lab. and Webster Drawings.

| Fig. No. | Circuit Arrangement | Bell Lab. Dwg. | Webster Dwg. |
| :---: | :--- | :---: | :---: |
| 102 | Terminal repeater arranged for H88 \& D88 <br> loaded cable requiring gain, equalization and <br> loop signaling. | SD-97047-01-13 | TE1384-1 |
| 103 | Terminal repeater arranged for non-loaded cable <br> requiring gain and loop signaling. | SD-97047-01-13 | TE1384-1 |
| 104 | Terminal repeater arranged for 600 ohm circuits <br> requiring gain and.loop signaling. | SD-97047-01-13 | TE1384-1 |
| 106 | Terminal repeater arranged for H88 \& D88 loaded <br> cable requiring no transmitting gain but equipped <br> with receiving gain and loop signaling. | SD-97047-01-13 | TE1384-1 |
| Terminal repeater arranged for H88 \& D88 loaded <br> cable where gain is not required but transmit <br> level control, receive level control and equaliza- <br> tion, and loop signaling. | SD-97047-01-14 | TE1384-2 |  |
| 107 | Terminal repeater arranged for H88 \& D88 loaded <br> cable where gain is not required but transmit and <br> receive level adjustment and loop signaling <br> is desired. | SD-97047-01-14 | TE1384-2 |
| 15 | Terminal repeater arranged for 600 ohm circuits <br> requiring no gain, but with transmit and receive <br> level control and loop signaling. | SD-97047-01-16 | TE1384-2 |

No separate figures are shown for use of precision network or low-pass filters since they may be used in all Webster 737 Repeater Systems, and with the 736 System when required by use of the TLC916 Apparatus Mounting Plate.

Webster Electric drawing TE1384-2, Fig. J3 shows the use of socket J3 of the TLC737. When no filter is required, strap thru assembly TLC893 is inserted in J3. When the TLC867 Low-Pass Filter is required, the TLC893 Assembly is replaced with the TLC867 Filter.

Webster drawing TE1384-3 is for use with the 736 Repeater Systems and shows the wiring required between the TLC736 Shelf and the TLC916 Apparatus Mounting Plate when a low-pass filter and/or idle circuit relay is required.

The Webster Electric TLC701 Term. Set utilizes
a separate TLC851 NBOC. Precision networks manufactured by Webster Electric may be used in place of the TLC851 NBOC when required.

The TLC701 Term. Set consists of a switchable 600 to 900 ohm hybrid coil arrangement, and has a switchable compromise network ( 600 or 900 ohms in serjes with a 2.0 mfd capacitor) and signaling by pass capacitor in the A-B lead circuit. When a fixed 600 or 900 ohm compromise network is sufficient and no build out capacitance is required, the TLC851 NBOC may be omitted and J2 socket may be left vacant. If precision networks are required to obtain an acceptable hybrid balance, J 2 socket is used for insertion of the network.

Networks used with the TLC701 Term. Set are listed below.
NOTE: Special networks available

| upon application. |
| :--- | :--- | :---: |


| Sales |
| :--- | :--- |
| Code |

## Special arrangements:

Idle circuit relay: for operation from IDLE LINE CIRCUIT CONTROL RELAY OF C.O. AND TIE TRUNK, OR RINGDOWN TIE TRUNKS equipped with signal key arrangements, to disable transmit loop on outgoing signal.

This idle circuit relay arrangement is for use on the following Western switch gear.

| 552A, D | 607A | 740 E |
| :--- | :--- | :--- |
| 556 | 608A | 756 A |
| 605A | 701 A | PBX |
| 606A, B | 711 A |  |

Its use is predicated upon modification of the C.O. TRUNK IDLE LINE CKT. CTROL. (SD-65781-01 and SD-66522-01). This arrangement is available on the 736 System by use of the TLC916 Apparatus Mounting Plate, and on the 737 System by factory modification of the TLC737 Repeater Mounting Shelf under TE1377. When modification TE1377 is used in the 737 System, the low-pass filter can not be used due to mounting requirements of the idle relay.

Webster drawing TE1377A shows the wiring modification of J3 socket and the addition of TB-2.

Plug-in units:
The following charts indicate the various components that may be used and the socket they may be used in.

737 System (TLC737 Shelf)

| Socket | Unit | Description |
| :---: | :---: | :---: |
| J1 | TLC701 | Term. set |
| J2 | TLC851 <br> TLC852 <br> TLC853 <br> TLC854 <br> TLC855 | NBOC <br> Precision network-unloaded cable. <br> Precision network-H88 loaded cable. <br> Precision network-open wire. Adjustable compromise network. |
| J3 $*$ | TLC893 <br> TLC867 <br> TLC812 | Strap thru assembly. <br> Low pass filter. <br> Dual pad assemblies. |
| J4 | TLC317 <br> TLC317X <br> TLC835 <br> TLC811 <br> TLC891 | V.F. Ampl. 24-48 VDC <br> Voltage Selection screw. <br> Adjustable impedance 600-900-1200 ohm. <br> V.F. Ampl. 24-48 VDC <br> Voltage Selection screw. <br> W/surge protection, adjust- <br> able impedance 600-900-1200 ohm. <br> Pad adaptor w/transformer for 89 type resistors. <br> Pad adaptor for 89 type resistor. <br> Strap thru assembly. |
| J5 | TLC317 <br> TLC317X <br> TLC836 <br> TLC811 <br> TLC891 | V.F. Ampl. 24-48 VDC <br> V oltage Selection screw. <br> Adjustable impedance 600- <br> 900-1200 ohm <br> V.F. Ampl. 24-48 VDC <br> Voltage Selection screw. <br> W/surge protection, adjust- <br> able impedance 600-900-1200 <br> ohm. <br> Pad adaptor $\mathrm{w} /$ transformer <br> for 89 type resistor. <br> Pad adaptor for 89 type <br> resistor. <br> Strap thru assembly. |
| J6 | TLC802 <br> TLC834 <br> TLC892 | Equalizer. <br> Transformer assembly. <br> Strap thru assembly. |

*When the 737 System is modified into TE1377 for idle circuit relay arrangement, the TE1377B Relay Assembly is the only plug-in unit usable in socket J3.

736 System (TLC736 Shelf)

| Socket | Unit | Description |
| :---: | :---: | :---: |
| J1 | TLC701 | Term. set. |
| J2 | TLC851 <br> TLC852 <br> TLC853 <br> TLC854 <br> TLC855 | NBOC. <br> Precision net. <br> Precision net. <br> Precision net. <br> Adjustable compromise net. |
| J3 | $\begin{aligned} & \text { TLC802 } \\ & \text { TLC834 } \\ & \text { TLC892 } \end{aligned}$ | Equalizer. <br> Transformer assembly. Strap thru assembly. |
| J4 | TLC317 <br> TLC317X <br> TLC835 <br> TLC811 <br> TLC891 | V.F. Ampl. 24-48 VDC <br> Voltage Selection screw. <br> Adjustable impedance 600 -900-1200 ohm. <br> V.F. Ampl. 24-48 VDC <br> Voltage Selection screw. <br> W/surge protection, adjust- <br> able impedance 600-900-1200 ohm. <br> Pad adaptor w/transformer for 89 type resistor. <br> Pad adaptor for 89 type resistor. <br> Strap thru assembly. |
| J5 | TLC317 <br> TLC317X <br> TLC836 <br> TLC811 <br> TLC891 | V.F. Ampl. 24-48 VDC <br> Voltage Selection screw. <br> Adjustable impedance 600-900-1200 ohm. <br> V.F. Ampl. 24-48 VDC <br> Voltage Selection screw. W/surge protection, adjustable impedance 600-900-1200 ohm. <br> Pad adaptor w/transformer for 89 type resistor. <br> Pad adaptor for 89 type resistor. <br> Strap thru assembly. |

See dwg. TE1384-3 for application of TLC916 Apparatus Mounting Plate for TLC867 LowPass Filter and idle line relay arrangement in 736 System.


## Description

The Webster Electric TLC737 4 wire repeater mounting shelf is designed to facilitate conver－ sion of 4 wire telephone circuits to 2 wire facili－ ties．As used in the Webster Electric 737 repeater system it provides services equivalent to the Western Electric Company＇s 24 V 4 A and 24 V 4 C systems．

The mounting shelf is wired to accept a wide array of Webster Electric plug－in modules facilit－ ating quick and simple assembly of various re－ peater requirements．It consists of six（6）wired sockets，a test and monitor jack field consisting of ten（10）jacks and a screw type（or optional wire－wrap）terminal board located on the rear panel．

Designed for use in a $19^{\prime \prime}$ or $23^{\prime \prime}$ rack the TLC737 mounting shelf requires $1-3 / 4$＇＇of panel space and measures $8-1 / 2^{\prime \prime}$ front to back fully comple－ mented．

## Ordering Information：

For 19＇rack order TLC737
For 23＂rack order TLC737－1．
For TE1377 19＂rack order TE1377
For TE1377 23＂rack order TE1377－1
Terminals－standard screw type．
Optional－specify－wire wrap terminals．
Note：${ }^{\prime \prime}{ }^{\prime \prime}$ units may be ordered and extend－ ed to $23^{\prime \prime}$ ，units by use of extension mounting plates．

## Technical Information

The TLC737 repeater mounting shelf is complete－ ly wired and ready to accept the various plug－in components to obtain the various arrangements
of repeaters normally required．Special wiring can be obtained from the Factory when required to meet special applications．
The Jack field consists of ten（10）standard $1 / 4^{\prime \prime}$ jacks wired in pairs．One jack is for monitoring only，the other is a cut out jack for insertion of test equipment．The function of each pair of jacks is clearly indicated schematically on the front panel jack field．The jack field operation is shown in the chart on Page 4.

## Signal Leads

J1 socket extends the $\mathrm{A}, \mathrm{B}, \mathrm{D}(\mathrm{S} 1), \mathrm{F}, \mathrm{G}, \mathrm{A} 3$（A1）， B3（B1）and SX leads to the terminal board for various signaling requirements．Additionally， terminals for＇$E$＇，type or SS－1 signaling，are provided．

For full wiring information consult Schematics 219－39941 and TE1377．

## Application Information

Drawings TE1384－1 and TE1384－2 have been produced only for aid in cross referencing Webster Electric TLC equipment to Western Electric equip－ ment used in 24V4 repeaters．Drawing TE1384－1 is similar to Bell Laboratories＇drawing SD－97047－ $01-13$ and shows the Webster Electric equipment that would be used to provide identical service in a 24 V 4 application．Drawing TE1384－2 is similar to figures 106 and 107 of Bell Laboratories＇ drawing SD－97047－01－14 and figure 115 of Bell Laboratories＇drawing SD－97047－01－16．These two （2）drawings are to be found in the section entitled 736 and 737 Systems，under REPEATER TERMIN－ ATING UNITS in your Webster Electric Telephone catalog．


2 Wire
Mon (J7) - Monitors 2 wire circuit
Hyb. in (J16) - Cuts out 2 wire drop and provides access to 2 wire circuit of hybrid
To cut out hybrid and test 2 wire facility insert dummy plug into hybrid in (J16) and insert test plug in mon (J7) jack.
Amplifier Input Transmit Pair
Mon (J8) - Monitors output of hybrid transmit leg and amplifier input In (J9) - Cuts out hybrid transmit leg and provides acces to amplifier input
To cut out amplifier input and test hybrid transmit leg, insert dummy plug into In (J9) jack and insert test plug in Mon (J8) jack.
Amplifier Output Transmit Pair
Out (J10) - Cuts out transmit pair of 4 wire facility and provides access to amplifier output
Mon (J11) - Monitors output of amplifier and transmit pair of 4 wire facility
To cut out amplifier output and test transmit pair of 4 wire facility insert dummy plug into Out jack (J10) and insert test plug into Mon (J11) jack.
Amplifier Input Receive Pair
Mon (J12) - Monitors receive pair of 4 wire facility and amplifier input In (J13) - Cuts out receive pair of 4 wire facility and provides access to amplifier input To cut out amplifier input and test receive pair of 4 wire facility insert dummy plug into In (J13) jack and insert test plug into Mon (J12).
Amplifier Output Receive Pair
Out (J14) - Cuts out input to hybrid receive leg and provides access to amplifier output Mon (J15) - Monitors output of amplifier and input to receive leg of hybrid To cut out amplifier output and test receive leg of hybrid insert dummy plug into Out (J14) jack and insert test plug in Mon (J13) jack.

Sockets J1 through J6 are wired for plug in components as indicated in the following chart.

| Socket | Type | Wired For |
| :---: | :---: | :---: |
| J1 | 20 Pin | TLC701 term set |
| J2 | 11 Pin | TLC851 NBOC <br> TLC852 Precision network unloaded cable <br> TLC853 Precision network H88 loaded cable TLC854 Precision network open wire TLC855 Adjustable compromise network |
| J3 | 11 Pin | TLC893 Strap through assembly <br> TLC812 Series dual attenuator TLC866 Low pass filter *TE1377B Idle circuit relay TLC881 Idle circuit relay TLC882 Idle circuit relay TLC883 Idle circuit relay |
| $\begin{gathered} \mathrm{J} 4 \\ \text { and } \\ \mathrm{J} 5 \end{gathered}$ | 11 Pin | TLC300 Series VF amplifier TLC835 1C pad adaptor with transformer TLC811 1C pad adaptor |
| J6 | 11 Pin | TLC802 Equalizer TLC834 Transformer assembly TLC892 Strap through assembly |

*TE1377B idle circuit relay is designed for use in a modified TLC737 mounting shelf (mod. TE1377). If TE1377 shelf is ordered it comes equipped with TE1377B relay for use in socket J3. A second terminal board (TB-2) is wired through and extends the "SL" and "B"' leads for the idle circuit relay keying, and the "AC" and " AB " leads for wiring options D and E . (Ref: Webster drawing TE1377)

## ELECTRIC COMPANY, INC.

subsidiary of sta-Rite Industries, Inc. installation and maintenance manual
Racine, Wisconsin 53403 $\qquad$

FUNCTION:
The TLC801 and 802 equalizers are plug-in modules designed to allow equalization of the facilities listed in the table below. The circuit is divided into two sections: (1) A Transformer, having low frequency loss circuits in the center-tapped secondary, to match the impedance of the facility in use. (2) A Resonant Circuit which is strapped across the output externally on the TLC801 and internally on the TLC802.

| Facility |  | Max. <br> Length <br> (Miles) | Fre. (KC) |
| :--- | :--- | :---: | :---: |
| 16 G | Non-Loaded Cable | 20 | $.15-6.0$ |
| 19 G | Non-Loaded Cable | 15 | $.15-6.0$ |
| H88 | Loaded Cable | 60 | $.15-3.5$ |
| H44 | Loaded Cable | 50 | $.15-5.0$ |
| 80 Mill <br> $100 \%$ Copper | Open Wire | 125 | $.15-6.0$ |
| 104 Mill <br> $40 \%$ Copper | Open Wire | 75 | $.15-6.0$ |

## CIRCUIT DESCRIPTION:

The general block is as follows: $R$ and $C$ provide low frequency equalization and $R$ ' L' $C^{\prime}$ provide higher frequency equalization, if required, different values of $R$ and $C$ may be obtained by a switch located on the outside of the unit. Various values of $L$, and $C^{\prime}$ are obtained by the facility switch of the inside of the unit and $R^{\prime}$ is a variable resistance located on the outside. The internal facility switch allows the unit to be used for H88, H44, Non-loaded are open wire facilities. The external switch provides various amounts of equalization or a short across $\mathrm{R} \& \mathrm{C}$ so no equalization is in the circuit and the TLC 801 or 802 may be used as impedance matching transformers alone.

NOTE - Pins 5, 6, 788 on the TLC802 provide a continuity path for a transmitting pair.



EQUALIZATION H44




SCHEMATIC TLC 802 EQUALIZER
$\qquad$


TLC811 Pad Adaptor


WECO 89 Type Resistor

TLC811 PAD ADAPTOR
The TLC811 pad adaptor unit is equal to the Western Electric 1C type pad and will accept the Western Electric 89 type plug in resistors to provide circuit attenuation in .25 db steps.

The TLC811 pad adaptor is a plug in unit and is normally inserted in J3 and J6 of the TLC731 unit when required. If pad adaptors are not used,
wired dummy plugs are provided for circuit continuity and must be inserted in place of the TLC811 pad adaptor.

The TLC813 variable attenuator ( $0-25 \mathrm{db}$ in 5 db steps), or the TE1284 attenuator ( $0-40 \mathrm{db}$ in 1 db steps) may be used in place of the TLC811 pad adaptor if desired.


## ELECTRIC COMPANY, INC.

subsidiary of Sta-Rite Industries, Inc.
installation and maintenance manual
$\qquad$
FUNCTION:
The TLC813 Attenuator is a plug-in unit designed specifically for use in telephone circuits to provide step Attenuation of V.F. levels.

## SPECIFICATIONS:

Precision "' T '' pads, constructed of $1 / 2 \mathrm{~W} 1 \%$ resistors provide precise Attenuation in steps of 5 db thru the range of $0-25 \mathrm{db}$.

Selection of Attenuator steps is by means of a, front panel mounted 6 position, rotary switch.
The value of each step is clearly silk screened on the front panel allowing rapid selection of Attenuator steps.
Attenuator Pads: $\quad 5$ " T " pad sections are provided in values of $5,10,15,20$ and 25 db . All resistors are $1 / 2$ watt $1 \%$.
Attenuator Adjustment: $0-25 \mathrm{db}$ in steps of 5 db by means of front panel rotary switch
Impedance:
600 ohms Input/ 600 ohms Output,
Dimensions:
$5-5 / 8^{\prime \prime}$ overall in length $\times 1-5 / 8^{\prime \prime}$
Finish: Zinc plate with Dichromate finish.
Weight: $\quad 16 \mathrm{oz}$.
Plug: $\quad 11$ Pin Amphenol 86 CP 11


| SW <br> Pos. | DB | Series <br> Res. | Shunt <br> Res. |
| :---: | :---: | :---: | :---: |
| 1 | 25 | 536 | 66.5 |
| 2 | 20 | 487 | 121 |
| 3 | 15 | 422 | 221 |
| 4 | 10 | 309 | 422 |
| 5 | 5 | 169 | 1000 |
| 6 | 0 | 0 | 0 |

$\qquad$

## FUNCTION：

The TLC831 Transformer is designed for applications where Hybrid circuits are derived from two（2）separate plug－ in transformer modules．When two（2）TLC831 transformers are used a return loss factor of at least 30 db is obtain－ ed over the V．F．band of $300-4,000$ CPS．

## SPECIFICATIONS：

By proper wiring of the socket 2 wire impedances of 600 or 900 ohms may be derived．When the 900 ohm 2 wire impedance is used the 4 wire circuit impedance may be selected for 600 or 900 ohms．

Electrostatic shields are provided to minimize the longitudinal effects．
Hybrid Arrangement：
Two（2）TLC831 Transformers．
Impedance：
2 wire： 600 or 900 ohms．
4 wire： 600 ohms when 600 ohm 2 wire impedance is used． 600 or 900 ohms when 900 ohm 2 wire impedance is used．
Insertion Loss：
Trans－Hybrid Loss：

Maximum Operating Level：
Current Capacity Signal Winding：
4 db maximum 200－6，000 CPS．

Maximum out of Balance Current Signal Winding：
Dimensions：
600 Ohms
900 Ohms
65 db
58 db
52 db
＠200－1，000 CPS $\quad 70.0 \mathrm{db} \quad 65 \mathrm{db}$

| ＠2000 CPS | 64.0 db | 58 db |
| :--- | :--- | :--- |
| ＠3000 CPS | 60.0 db | 52 db |

dc $=0$
60.0 db

52 db
I dc $=0$
18 DBM

Finish：
150 MA

Weight：
4－31／32＇，long（excluding plug）x 1－5／8＇＂wide x 1－5／8＇＇high．
Zinc plate with Dichromate finish．
Plug：
1 lb ．approximately
12 pin amphenol（to mate with amphenol 77 M1P12 socket）


The above drawing shows two（2）TLC831 transformers connected to provide a full Hybrid circuit．Signalling facil－ ities may be drived from pins $8 \& 9$ of $T 2$ by extending the＂A＂\＆＂B＂leads from the socket as shown．If signalling is not required，points $8 \& 9$ must be strapped．

For 600 Ohm Impedance of two wire circuit use appropriate 600 ohm balancing network． Transmit and receive circuits are connected to points 182 of respective sockets．

For 900 Ohm Impedance of two wire circuit use appropriate 900 ohm balancing network． If 600 ohm transmit and receive circuits are desired connect circuit to $10 \& 7$ of re－ spective transformer．If 900 ohm two wire and transmit and receive circuits are desired connect transmit and receive circuits to points $1 \& 2$ of respective transformers．
$\qquad$

FUNCTION:
The TLC832 repeating coil is designed to provide high quality and efficient operation between the combination of impedances listed below. When used in a balanced circuit, the balanced windings of this transformer provide 90 db attenuation to longitudinal currents. Electrostatic shields are provided. It has a frequency response of $20-20,000$ $\mathrm{cps} \pm 1 \mathrm{db}$, and a maximum operating level of +25 dbm . The windings will handle 150 ma of ringing current. This transformer provides at least 50 db of magnetic shielding.
SPECIFICATIONS:
This transformer is of the plug-in type and as Standard has a 11 pin amphenol 86CP11 plug so that eight (8) transformers may be mounted on a 19 '' rack panel requiring $1-3 / 4$ " of panel height. THIS TRANSFORMER MAY BE EQUIPPED WITH A 12 LUG HEADER, If so ordered, AT NO EXTRA COST, when it is desired to solder leads directly to the transformer.
TRANSFORMER CONNECTIONS:
Source Impedance: 500/600 - connect source to 185 , strap $2 \& 3$. C. T. is $2 \& 3$
$125 / 150$ - connect source to 185 , strap $1 \& 3,2 \& 5$. C.T. is 4
Load Impedance: $\quad 500 / 600-$ connect load to $6 \% 10$, strap $8 \& 9$. C. T. is $8 \& 9$.
$125 / 150$ - connect load to 6810 , strap 689,8810 . C. T. is 7 .
NOTE: To phase all coils in series aiding strap $2 \& 3,5 \& 6,8 \& 9$.
Dimensions: $5-9 / 16^{\prime \prime}$ length $\times 1-5 / 8$ '' sq.
Weight: $\quad 1 \mathrm{lb}$. approximately
Finish:
1 lb . approximately
Telephone Gray
Plug:
Standard 11 pin amphenol 86CP11. Optional 12 pin header for direct solder connections.

$\qquad$

## FUNCTION:

The TLC833 line transformer is designed to meet requirements of the telephone industry for providing a 600 ohm drop impedance from a variety of line impedances.

SPECIFICATIONS:
If signalling facilities are required line impedances of $150,250,600$ and 900 ohms may be obtained by proper strapping on the mounting socket.

Impedances:

Insertion Loss:
Frequency Response:
Maximum Operating Level:
Maximum out of Balance Current:
Dimensions:
Longitudinal Balance:
Finish:
Socket:

## Weight:



Drop: 600 ohms 200 to 3 KC IDC $=100 \mathrm{MA}$
Line: 600 or 900 ohms when signalling facilities are required. 150 or 250 ohms when signal facility not required.
0.5 db at $1,000 \mathrm{CPS}$
$\pm 1 \mathrm{db} 100-10,000$ CPS Ref. 1 KC
120 MA
100 MA
$4-31 / 32$ '' long (excluding plug) x $1-5 / 8^{\prime \prime} \mathrm{SQ}$. (may be mounted on $1-3 / 4$ ' high pane1).
Electrostatic shielding provided to minimize longitudinal effects.
Zinc plate with Dichromate finish.
11 pin amphenol 86CP11 standard optional (12 pin amphenol) (to mate with 77 M1P12 socket).
1 lb . approximately



| Line | Line | TLC 833 <br> Strap, <br> or "C, |  | Strap | Drop |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Drop <br> Term |  |  |  |  |
| 900 | $5-10$ | $7-8,2-3$ |  | 600 | $1-4$ |
| 600 | $6-9$ | $7-8,2-3$ |  | 600 | $1-4$ |
| 225 | $5-7$ | $2-3$ | $5-8,7-10$ | 600 | $1-4$ |
| 150 | $6-7$ | $2-3$ | $6-8,7-9$ | 600 | $1-4$ |

## GENERAL:

The TLC834 Transformer assembly is a plugoin module containing two (2) minature line transformers and a front panel mounted impedance switch. The primary windings have an impedance of 600 ohms. The secondary windings have selectable impedances of 150,600 or 1200 ohms with simplex taps.
Operation of the front panel impedance switch selects either 150, 600 or 1200 ohm impedance values of both transformers secondaries at the same time. Independant selection of different impedance on each coil is not possible.
The TLC834 unit has been designed primarily for use in Webster Electric 2 to 4 or 4 to 4 wire repeaters. It may be used in WECO 24V4 systems in place of the 359 type equalizers by means of the Webster Electric TLC895 adaptors and when Webster Electric TLC300 series amplifiers equipped with TLC894 adaptors are used in place of WECO 227A, B or C amplifiers.
It may be used in any 4 wire V.F. facility when both transmit and receive circuits must be converted from 600 to 150,600 or 1200 ohm impedances.

## SPECIFICATIONS:

Impedance: Primary: 600 ohms $\pm 10 \%$.
Secondary: 150,600 or 1200 ohms $\pm 10 \%$ 。
Impedance Switch: Front panel mounted.
Frequency Response: $\pm 0.5 \mathrm{db} 200-10,000 \mathrm{cps}$.
Insertion Loss: $1.25 \mathrm{db} 200 \cdot 5,000 \mathrm{cps}$.
( 1.5 db @ $10,000 \mathrm{cps}$ )
Simplex Current: Max. 100 ma ( 5 ma out of balance).
Longitudinal Balance: Bifilar windings w/Electrostatic shielding provided to obtain maximum attenuation to longitudinal currents.
Size: $1-5 / 8^{\prime \prime} \times 1-5 / 8^{\prime \prime} \times 5-5 / 8^{\prime \prime}$ overall.
Finish: Zinc plate dichromate finish.
Plug: 11 pin 86CP11.
Weight: 16 oz . approx.



## GENERAL

The TLC835 and 836 level control pad adaptors are designed to be used with WECO 89 type resistors for level control of V.F. circuits when gain is not required. They are the functional equivalent of the WECO $849 \mathrm{~A} \& \mathrm{~B}$ level control pads with the added feature of having the secondary windings switchable in impedance from 150 to 600 or 1200 ohms. Simplex taps are provided.

The pad adaptor resistive network is on the 600 ohm primary winding cycle of the transformer and is fixed in impedance.

Designed for use in Webster Electric 2 to 4 wire and 4 to 4 wire repeater systems the TLC835 is designed to be used in the transmit amplifier socket while the TLC836 is designed for use in the receive amplifier circuit.

These units may be used for level control and impedance matching in any V.F. circuit when required. It mounts in a standard 11 pin octal socket.

## INSTALLATION:

By removing the chassis from the cover assembly the screw driver adjustable impedance switch is exposed. Switch index positions are clearly marked 1200-600-150 for 1200,600 or 150 ohm selection.

## SPECIFICATIONS:

impedance: primary: 600 ohms $\pm 10 \%$. sec ondary: 150,600 or 1200 ohms $\pm 10 \%$.
impedance switch: internally mounted rotary switch.
frequency response: $\pm 0.5 \mathrm{db} 200-10,000 \mathrm{cps}$
insertion loss: $1.25 \mathrm{db} 200-5,000 \mathrm{cps}$
( $1.5 \mathrm{db} @ 10,000 \mathrm{cps}$ )
simplex current: max. 100 ma ( 5 ma out of balance)
longitudinal balance: bifilar windings w/electrostatic shielding provided to obtain maximum attenuation to longitudinal currents.
size: $1-5 / 8^{\prime \prime} \times 1-5 / 8^{\prime \prime} \times 2-1 / 4^{\prime \prime}$ overall (less 89 resistor)
finish: zinc plate dichromate finish
plug: 11 pin 86CP11
weight: 16 oz . approximately



## C



## FUNCTION:

TLC837 Hybrid Coil Assembly is a plug-in unit for use in deriving 2-4 wire telephone circuits.
TLC837 is completely wired, containing the hybrid coils, a front panel impedance switch and two (2) 1.0 mfd capacitors. All legs of the hybrid, including the $A$ and $B$ leads and the balancing winding are wired to the 11 pin amphenol plug. No compromise or signal bypass networks are provided within the unit. Designed primarily for use in the Webster 733,740 or 741 repeater systems, the unit may also be mounted in any suitable mounting plate equipped with appropriate 11 pin sockets.
Although the small physical size of TLC837 makes it suitable for mounting in standard VF amplifier shelves, the hybrid coil is the same precision, high quality coil used in the Webster TLC701 and 711 term. sets.

## INSTALLATION:

Front panel mounted impedance switch is internally wired to the hybrid coils so that either 600 or 900 ohm, 2 -wire circuits may be obtained. Two (2) 1.0 mfd capacitors are wired in parallel in the hybrid balancing windings to offset signal bypass capacitance.

CAUTION: If $A$ and $B$ leads, or $D C$ blocking of the 2 -wire circuit (Tip and Ring), are not required, the $A$ and $B$ leads (Pins 5 and 6) must be strapped on the mating socket and the two (2) 1.0 mfd capacitors (C1 and C2) must be strapped out of the balance winding. (Cover of TLC837 must be removed to strap out C1 and C2). Capacitance for deriving A and B leads must be externally provided.
External hybrid balancing networks, either compromise or precision types, must be used with TLC837. Webster networks TLC852 thru TLC856 are suitable for such use. All of the above networks also contain signal bypass capacitors for deriving A and B leads from the TLC837.
When used in arrangements other than the Webster 733,740 or 741 repeater systems, wiring should be made directly to the mating socket. Suggested for mounting are Webster TLC904, 905 or 916 mounting shelves. TLC 904 is for 19" rack mounting, TLC905 for $23^{\prime \prime}$ mounting, and TLC916 for KTU mountings. Appropriate balancing networks should be mounted adjacent to TLC837.
Connections to the mating socket are as follows: (See figure 2)
2-Wire Branch: Tip to Pin 1
Ring to Pin 2
$A$ and $B$ Leads: $A$ to $\operatorname{Pin} 5$
B to Pin 6
Transmit Branch: Tip to Pin 3
Ring to Pin 4
Receive Branch: Tip to Pin 8
Ring to Pin 7
Balance Network: To Pins 9 and 10
Chassis Ground: Pin 1:
If $A$ and $B$ leads are used, connect pins 5 and 6 to bypass network in balancing network. See Caution note above.
NOTE: To obtain maximum return loss, the capacitance in the A-B lead circuit and the balancing windings (C1 $\& C 2$ ) must be equal. Jf : 0 mfd is used for signal bypass in the A-B leads, C1 8 C 2 must be in parallel. If 1.0 mfd is usef an the $A-B$ lead circuit unsolder one side of C 2 capacitor and tape back.

## OPERATION:

Operate the front panel switch for either 900 ohm 2 -wire impedance, or for 600 ohm 2 -wire impedance. In either position the proper ratio is maintained to provide 600 ohm impedance on the 4 -wire branches.

It is to be noted that in the 600 ohm position the coil ratio is $1: 1$. This position should be used at all times except when 900 ohm 2 -wire circuits are encountered.

## MAINTENANCE:

When properly connected, no appreciable maintenance will be required other than routine operational checks as may be required.

| SPECIFICATIONS: Impedances: | 2-Wire: 600 or 900 ohm selectable wi 4-Wire: 600 ohm. | panel mounted switch. |
| :---: | :---: | :---: |
| Hybrid Insertion Loss: | Transmit Circuit: 4 db approximate. Receive Circuit: 4 db approximate | $200-6000 \mathrm{~Hz}$ |
| Trans-Hybrid Loss: <br> ( 600 ohms in series $\mathrm{w} / 2.0 \mathrm{mfd}$ termination) | $200-1000 \mathrm{~Hz}$ at least 70 db <br> 2000 Hz 64 db <br> 3000 Hz 60 db <br> 4000 Hz 58 db |  |
| ( 900 ohms in series $\mathrm{w} / 2.0 \mathrm{mfd}$ 2 -wire termination) | $200-1000 \mathrm{~Hz}$ at least 65 db <br> 2000 Hz 58 db <br> 3000 Hz 52 db <br> 4000 Hz 50 db |  |
| Return Loss: <br> (when properly terminated) | $300-4000 \mathrm{~Hz}$ greater than 30 db . |  |
| Longitudinal Balance: | $200-4000 \mathrm{~Hz}$ greater than 60 db . |  |
| Frequency Response: | $200-4000 \mathrm{~Hz}$ Voice Band $\pm 1 \mathrm{db}$. |  |
| Maximum Operating Level: | +18 dbm . |  |
| Current Capacity Signal Winding: | 150 ma . |  |
| Maximum Out of Balance Current in Signal Winding: | 100 ma . |  |
| Dimensions: | 1-5/8'' $\times 1-5 / 8 \prime$ x 5-5/8'' overall. |  |
| Weight: | 1 lb . approximately. |  |
| Color: | Zinc plate with dichromate finish. |  |
| Plug: | 11 Pin Amphenol (86CP11). |  |



FIG. 1 DIMENSIONS


FIG. 2 SCHEMATIC
$\qquad$


TLC851 NBOC
The TLC851 NBOC（Net Building Out Capac－ itors）unit is a plug－in module to provide additional capacitance for the integral compromise network of the TLC701 term set，or for precision matching of capacitance in the 2 －wire circuit．

The front panel of the TLC851 NBOC unit mounts seven（7）screw type switches which when closed（full clockwise）allows adding of capac－ itance to the compromise network of the TLC701 in .001 mfd steps from .001 to .10 mfd ，by parallel－ ing the desired capacitors．


No wiring of the TLC731 unit is required． Simply plug in the TLC851 NBOC unit and select the desired capacitance from the front panel．

When precision networks are required for bal－ ancing against specific cable sections consult the NETWORK section of the Webster Electric Telephone Products catalog．
$\qquad$
FUNCTION:
The TLC852 precision network is a plug-in unit which provides a precise balance in hybrid circuits against unloaded cable circuits.

## SPECIFICATIONS:

The network consists of a series network of precision resistors plus a termination resistor. By appropriate strapping the correct resistive element may be obtained. Capacitance may be introduced if needed by proper strapping of the capacitor network which consists of seven (7) capacitors ranging in value from .033 mf to .18 mf .

A silk-screened strapping circuit board is exposed when the unit cover is removed. All strapping of resistive and capacitive elements is by means of soldering straps between the appropriate circuit elements on this board.

By-pass facilities are provided. However, when used with Webster Electric TLC701 4 wire termination set, signal by-pass facilities are not used, since the TLC701 has this feature included.

| Dimensions: | $4-31 / 32 '$ ' long (excluding plug) $\times 1-5 / 8^{\prime \prime} \times 1-5 / 8^{\prime \prime}$ |
| :--- | :--- |
| Finish: | Zinc plate with Dichromate finish |
| Plug: | 11 pin amphenol $86 C P 11$ |
| Weight: | 1 lb. approximately |




| Length - Miles |  | Cable Type 16th | 19 DNB | 19 CNB | 22 BSA | 24 ASM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { wire } \\ & 16,19,22 \mathrm{G} \\ & \hline \end{aligned}$ |  | Connect | Connect | Connect | Connect | Connect |
| $1 / 2$ | 1/2 | E2-E13-E10 | $\begin{aligned} & \text { E2-E13 } \\ & \text { E3-E10 } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { E2-E12 } \\ & \text { E3-E10 } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { E3-E12 } \\ & \text { E4-E10 } \end{aligned}$ | $\begin{aligned} & \text { E1-E2, E12-E20 } \\ & \text { E6-E10, E4-E19 } \\ & \hline \end{aligned}$ |
| 1 | 3/4 | $\begin{aligned} & \text { E2-E11 } \\ & \text { E3-E10 } \end{aligned}$ | $\begin{aligned} & \text { E4-E10 } \\ & \text { E3-E11 } \end{aligned}$ | $\begin{aligned} & \hline \text { E3-E14 } \\ & \text { E4-E10 } \end{aligned}$ | $\begin{aligned} & \text { El-E8 } \\ & \text { E14-E9 } \end{aligned}$ | $\begin{aligned} & \text { El-E3, E14-E20 } \\ & \text { E5-E19, E7-E10 } \end{aligned}$ |
| 11/2 | 1 | $\begin{array}{\|l\|} \hline \text { E1-E2, E3-E13 } \\ \text { E11-E4-E10 } \\ \hline \end{array}$ | $\begin{aligned} & \text { E2-E13 } \\ & \text { E4-E1I, E5-E10 } \end{aligned}$ | $\begin{aligned} & \text { E2-E12 } \\ & \text { E4-E14, E5-E10 } \end{aligned}$ | $\begin{aligned} & \text { E3-E12 } \\ & \text { E14-E9, E4-E8 } \end{aligned}$ | $\begin{aligned} & \text { E1-E2,E4-E13 } \\ & \text { E9-E12,E5-E8 } \end{aligned}$ |
| 2 | 11/4 | $\begin{aligned} & \text { E3-E15 } \\ & \text { E4-E10 } \end{aligned}$ | El-E8, E16-E9 | $\begin{aligned} & \text { E18-E20 } \\ & \text { E1-E8, E19-E9 } \end{aligned}$ | $\begin{aligned} & \text { E13-E15-E20 } \\ & \text { E1-E6 } \\ & \text { E7-E14, E19-E9 } \end{aligned}$ | E13-E20, El-E4 E7-E1I, E5-E19 |
| 21/2 | 11/2 | $\begin{aligned} & \text { E1-E2,E15-E4 } \\ & \text { E3-E13, E5-E10 } \end{aligned}$ | $\begin{aligned} & \text { E2-E13 } \\ & \text { E3-E8, E16-E9 } \end{aligned}$ | $\begin{aligned} & \text { E2-E12,E18-E20 } \\ & \text { E3-E8, E19-E9 } \end{aligned}$ | $\begin{aligned} & \text { E13-E15-E20 } \\ & \text { Ell-E4, E5-E12 } \end{aligned}$ E19-E9, ET-E14 | $\begin{aligned} & \text { E9-E10 } \\ & \text { E5-E11, E8-E } 12 \end{aligned}$ |
| 3 | 13/4 | $\begin{aligned} & \text { E2-E11, El5-E4 } \\ & \text { E5-E10 } \end{aligned}$ | $\begin{aligned} & \text { E3-E11 } \\ & \text { E4-E8, E16-E9 } \end{aligned}$ | $\begin{aligned} & \text { E18-E20, E3-E14 } \\ & \text { E4-E8, E19-E9 } \end{aligned}$ | $\begin{aligned} & \text { E18-E20 } \\ & \text { E4-E14 } \\ & \text { E8-E19 } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { E1-E2 } \\ & \text { E14-E8, E4-E12 } \end{aligned}$ |
| $31 / 2$ |  | $\begin{aligned} & \text { E1-E2, E15-E5 } \\ & \text { E3-E13, E11-E4 } \\ & \text { E6-E10 } \end{aligned}$ | $\begin{aligned} & \text { E2-E13, E4-E11 } \\ & \text { E5-E8, E16-E9 } \end{aligned}$ | $\begin{aligned} & \text { E2-E12, E18-E20 } \\ & \text { E4-E14, } \\ & \text { E5-E7, E19-E9 } \\ & \hline \end{aligned}$ |  |  |
| 4 |  | $\begin{aligned} & \text { E3-E15 } \\ & \text { E5-E16, E6-E10 } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { E15-E7 } \\ \text { E1-E6, E16-E9 } \\ \hline \end{array}$ | $\begin{aligned} & \text { E13-E15-E7 } \\ & \text { E1-E6, E18-E20 } \\ & \text { E19-E9 } \end{aligned}$ |  |  |
| $41 / 2$ |  | $\begin{aligned} & \text { E1-E2, E7-E10 } \\ & \text { E15-E5-E6 } \\ & \text { E3-E13, E4-E16 } \end{aligned}$ | $\begin{aligned} & \text { E2-E13, E7-E15 } \\ & \text { E3-E6, E16-E9 } \end{aligned}$ | $\begin{aligned} & \text { E13-E15-E7, E2-E12 } \\ & \text { E18-E20, E3-E6 } \\ & \text { E19-E9 } \end{aligned}$ |  |  |
| 5 |  | $\begin{aligned} & \text { E15-E5, E1-E3 } \\ & \text { E4-E1,' E6-E16 } \\ & \text { E7-E10 } \end{aligned}$ | E15-E7, E1-E4 <br> Ell-E5, E16-E9 | $\begin{aligned} & \text { E13-E15-E7 } \\ & \text { E1-E4, E18-E20 } \\ & \text { E14-E5, E19-E9 } \end{aligned}$ |  |  |
| 51/2 |  | $\begin{aligned} & \text { E1-E2, E15-E5 } \\ & \text { E4-E11, E6-E16 } \\ & \text { E6-E16, E7-E10 } \end{aligned}$ | $\begin{aligned} & \text { E2-E13 } \\ & \text { E15-E7, E4-E11 } \\ & \text { E5-E6, E16-E9 } \end{aligned}$ | $\begin{aligned} & \text { E13-E15-E7, E2-E12 } \\ & \text { E18-E20, E3-E4 } \\ & \text { E14-E5, E19-E9 } \\ & \hline \end{aligned}$ |  |  |
| 6 |  | $\begin{aligned} & \text { E2-E13-E19, E15-E5 } \\ & \text { E4-E1,' E12-E20 } \\ & \text { E6-E16, E7-E10 } \\ & \hline \end{aligned}$ | E13-E3-E19 <br> E11-E5, E12-E20 <br> E16-E9, E7-E15 |  |  |  |

$\qquad$

FUNCTION:
The TLC853 precision network is a plug-in unit which provides a precise balance in hybrid circuits against H88 type loaded cable circuits.

## SPECIFICATIONS:

The TLC853 contains a basic circuit consisting of inductance, capacitance, and resistance, and a series of building out capacitors to allow close matching of termination to the cable facility.

By-pass facilities are provided. However, when used with Webster Electric TLC701 4 wire termination set, signal by-pass facilities are not used, since the TLC701 has this feature included.

Strapping on the internal circuit board allows use on 19 CNB H88, 22BSA H88, 16th H88 facilities.
Proper build out capacitance is obtained by proper strapping on the internal circuit board (. $001-.033 \mathrm{mf}$ )
$\begin{array}{ll}\text { Dimensions: } & 4-31 / 32 ' \prime \text { long (excluding plug) } \times 1-5 / 8^{\prime \prime} \times 1-5 / 8^{\prime \prime} \\ \text { Finish: } & \text { Zinc plate with Dichromate finish } \\ \text { Plug: } & 11 \text { pin amphenol 86CP11 } \\ \text { Weight: } & 1 \mathrm{lb} \text {. approximately }\end{array}$

| Facility | End Section |
| :--- | :---: |
| 19CNB | 900 |
| 22BSA | 900 |
| 16TH | 330 |
| 19DNB | 330 |

Build-Out Cap. Per 1000 ft . Plus End Sect.
.016
.0155
.0125
19DNB
330

notes
1 STRAP EIB TO (EI THRU EIO) FOR DESIRED BUILD OUT CAPACITANCE.
2 ALL CAPACITORS SHOWN IN MF 200 V
3 ALL RESISTORS $1 / 2 \mathrm{~W}$ 1\%
4 installer to strap as requireo


## FUNCTION

The Webster Electric TLC855 adjustable compromise network is designed for use in hybrid arrangements to obtain a compromise balance against the two (2) wire facility.

The TLC855 network is designed to plug into an Amphenol 78-S11 socket and consists of an adjustable resistive network in series with 2.0 mfd . of capacitance, four (4) net building out capacitors and two (2) 1.0 mfd . capacitors for deriving signaling circuits.

The adjustable resistive network consists of R1, R2 and R3 and provides a resistive element adjustment thru a range of 400 to 1400 ohms.

## SPECIFICATIONS

Resistive Network: Externally adjustable from 400 to 1400 ohms.

Net Build Out Capacitors: 4-with internal strapping facilities.

Signal By-pass Capacitors: 2-with internal strapping facilities.

Test Jacks: Accessable on front for predetermining resistance and capacitance requirements.

The four (4) net build out capacitors, C3 thru C6, are for use in balancing out the two (2) wire cable capacitance. Capacitance required may be determined at the C and $\mathrm{C}-\mathrm{R}$ test sockets on the front panel. The resistive element of the network may be pre-adjusted at the $R$ and $C-R$ test sockets. Wire straps must be connected on the internal strapping board to obtain NBOC balance as required, and to derive signaling circuits when used with TLC831 hybrid coils.

When this unit is used with Webster Electric TLC701 term sets, the signal by-pass capacitors C7 and C8 are not used. The TLC701 term set is equipped with internal by-pass capacitors.

Plug: 11 pin Amphenol (86CP11) fits Amphenol socket \#78-S11.

Finish: Zinc plate with Dichromate finish.
Dimensions: $1-5 / 8^{\prime \prime}$ sq. x 4-31/32' long excluding plug.

Weight: 10 oz.


## INSTALLATION:

The hybrid balance pair is connected to pins 1 and 2, the signal by-pass capacitors to pin 3 and 4 , of the 11 pin plug. When 1.0 mfd . is required in the signal by-pass circuit, no internal strapping is required. If 2.0 mfd . is required in the signal circuit, strap E6 to E7. Chassis ground is connected to pin 11. When extracting the TLC855 unit from its mounting socket a TLC914 extractor tool should be used to prevent damage to the plug and socket.

## ADJUSTMENT

When adjusting the TLC855 network the test jacks; $\mathrm{C}, \mathrm{R}$ and $\mathrm{C}-\mathrm{R}$ located on the front panel may be used. The resistive element is adjusted by potentiometer R1. Test jacks R and $\mathrm{C}-\mathrm{R}$ are used for resistive adjustments. A capacitance decade box may be connected to test jacks $C$ and $\mathrm{R}-\mathrm{C}$ and adjusted for maximum transhybrid loss. When the capacitance determined by the decade box is determined, the NBOC value may then be permanently strapped between terminals E1 and E8.

R1 should be adjusted to the known resistive element of the two (2) wire line before insertion into its mounting socket. After insertion and when the capacitance has been determined by the capacitance decade box, R1 may require a slight readjustment to obtain optimun transhybrid loss. After final adjustment of R1 its locking nut should be carefully tightened.

The NBOC (C3 thru C6) may be wired in parallel, series or series parallel to obtain the required capacitance - see strapping chart.

## CAPACITANCE STRAPPING CHART

| Required Capacitance 0.033 mfd . | ```Strop E1-E2-E3-E4-E5 and E8-E9-E10-E11-E12``` |
| :---: | :---: |
| 0.020 (0.0197) mfd. | $\begin{aligned} & \mathrm{E} 1-\mathrm{E} 2-\mathrm{E} 4 \\ & \text { and } \\ & \mathrm{E} 8-\mathrm{E} 9-\mathrm{E} 11 \end{aligned}$ |
| 0.010 mfd . | $\begin{aligned} & \text { E1-E3 } \\ & \text { and } \\ & \text { E8-E10 } \end{aligned}$ |

Other values of capacitance may be obtained by parallel, series or series parallel strapping of capacitors.

## MAINTENANCE

Field maintenance is limited to replacement of resistors and capacitors and must be replaced with equal value components. It is suggested that the TLC855 unit be returned to the factory when repairs are required.


## FUNCTION:

The TLC 866 and 867 filters are low pass type having an effective band pass of 0 to $2,580 \mathrm{cps}$ and a cut off frequency of $3,000 \mathrm{cps}$. Designed for use in 600 ohm telephone transmission circuits. The balanced circuit configuration provides excellent voice band articulation. The 867 is designed for use with the Webster $2-4$ wire terminating systems.

## SPECIFICATIONS:

The TLC 866 and 867 filters are of the plug-in type and are normally supplied with an Amphenol 86CP11, 11 pin plug for use with Webster Electric Company terminating systems. The 866 may be ordered with a 20 pin plug for mounting in an Amphenol 77MIP-20 socket at no extra cost if desired.
Type:
Impedance:
Insertion Loss vs Frequency:

Low pass filter (0-2850 cps), balanced.
600 ohm nominal.
$0.2 \mathrm{db}-50-2,000 \mathrm{cps}$
$2.4 \mathrm{db}-2,850 \mathrm{cps}$
$11.6 \mathrm{db}-3,100 \mathrm{cps}$
$35.8 \mathrm{db}-3,400 \mathrm{cps}$
$41.4 \mathrm{db}-3,500 \mathrm{cps}$.
$1-5 / 8^{\prime \prime} \times 1-5 / 8^{\prime \prime} \times 5-5 / 8^{\prime \prime}$ overall.
12 ounces approximately.
Zinc plate with dichromate finish.
11 pin Amphenol 86CP11 (standard). (Optional) 20 pin plug to mount in 77MIP-20 socket.




TLC881


FUNCTION
TLC881 thru 884 relay assemblies are designed to provide "Idle Circuit" termination in Webster VF repeater systems. This series of Idle Circuit relays provide a direct short across the transmit branch of the hybrid in Webster 732,733 and 737 repeater systems. They may be used in 736 systems when TLC916 KTU apparatus mounting plates are used.

The relay assemblies are completely wired. TLC881 and 882 are mounted in clear plastic cases, and are primarily intended for use in the 732 system. TLC883 and 884 are enclosed in metal cans, and are designed specifically for use in 736 and 737 repeater applications.

TLC881 and 883 are designed to utilize 24 VDC power sources. TLC882 and 884 are designed for 48 VDC systems. Each relay consists of two (2) Form "A" contacts wired in parallel.

## INSTALLATION

Make certain that the relay selected matches the power source to be used. If used in the Webster 732, 733 or 737 systems, the relay mounting socket is properly wired. Consult the appropriate system schematic for wiring of relay control circuitry.

When used in special field wired systems, wire mating sockets as follows:

$$
\begin{array}{ll}
\text { Transmit Branch of Hybrid } & \text { Terminals } 1882 \\
\text { Transmit Branch to Amplifier } & \text { Terminals } 384 \\
\text { Relay Operate Circuit } & \text { Terminals } 5 \& 6 \\
\text { Chassis Ground } & \text { Terminal } 11
\end{array}
$$

Wiring between terminals $7 \& 9$ and $8 \& 10$ are factory wired to provide continuity of the receive branch in factory wired repeaters only.

## SPECIFICATIONS

Contacts:
Contact Material:

Coil Resistance:

Dimensions: TLC881 \& 882 TLC883 \& 884

Color:

$$
\begin{aligned}
& \text { TLC881 \& } 882 \\
& \text { TLC883 \& } 884
\end{aligned}
$$

Plug:

2, Form "A" wired in parallel
TLC881-Silver
TLC882 - Silver
TLC883 - Gold Plated Silver
TLC884-Gold Plated Silver
TLC881-500 ohms
TLC882-1300 ohms
TLC883-500 ohms
TLC884-1500 ohms
$1-3 / 8$ '' $\times 1-3 / 8^{\prime \prime} \times 2-5 / 16^{\prime \prime}$
$1-5 / 8$ ', $\times 1-5 / 8$ '' $\times 5-5 / 8^{\prime \prime}$ overall
Clear Plastic
Zinc Plate with Dichromate finish.
11 Pin (Amphenol 86CP11)



SCHEMATIC


## general

The TLC891， 892 and 893 strap thru assemblies are designed for use with Webster Electric 2 to 4 wire and 4 to 4 wire V．F．repeaters systems．Their function is to provide circuit continuity when other plug－in modules（listed below）are not used．

The TLC891 assembly is used in the transmit or receive amplifier sockets．
The TLC892 assembly is used in the equalizer socket．
The TLC893 is used in the filter or idle circuit relay socket．

## INSTALLATION

These units are not interchangeable due to socket wiring arrangements．Care must be taken that the proper strap thru assembly be used otherwise power supply voltage may be shorted or transmission circuit con－ tinuity may be interrupted．



TLC 891


TLC 892


TLC 893

## GENERAL:

The TLC 894 is an adaptor unit which allows a Webster Electric TLC V.F. amplifier to be plugged into a Western Electric amplifier socket.

The TLC894 adaptor is primiarly designed for use in 600 ohm circuits. The fifteen pin plug (P1) has straps between pins $2 \& 4$, and $8 \& 10$. This is to provide proper circuit connection between 600 or 1200 ohm circuit arrangement. Actual impedance of input and/or output of the Webster Electric V.F. amplifier is determined within the amplifier by simple strapping.

## SPECIFICATIONS:

size: $1-5 / 8 \times 1-5 / 8 \times 1-1 / 2$ excluding plug.
finish: Zinc plate with dichromate finish.
plug: Cinch $\$ 213-15-10-115$
socket: Amphenol $\# 78$-S11.

## INSTALLATION:

Caution: The internal straps on P1 (pins 2-4, 8-10) are for transmission circuit continuity only. If WECO 359A or 359D type equalizers are used the equalizing circuit will not be connected thru to the amplifier. Where equalization of the receive circuit is required a Webster Electric TLC 802 universal equalizer equipped with a TLC 895 adaptor may be used in place of the WECO equalizer.


$\qquad$
FUNCTION:
The TE1286 line transformer is designed specifically to provide an output (drop) impedance of 1500 ohms from various line input impedances.

## SPECIFICATIONS:

By proper strapping on the socket, which mounts the plug-in transformer, line impedances of $125,150,500$ or 600 ohms may be obtained, while maintaining the 1500 ohm drop impedance.

Designed for telephone V.F. circuits, electrostatic shields are provided to minimize longitudinal effects.

Impedances:
Insertion Loss:
Frequency Response:
Maximum Operating Level:
Maximum Current in Line Winding:
Maximum out of Balance Current in Line Winding:
Dimensions:
Finish:
Plug:
Weight:

Drop 1500 ohms source - $125 / 150,500 / 600$ ohms 200 to 3 KC Less than 0.6 db at 1000 cps
$\pm 1 \mathrm{db} 100-10,000 \mathrm{cps}$ ref to 1 KC IDC $=0 \mathrm{MA}$
$+20 \mathrm{dbm}$
100 MA
100 MA
5-5/8' overall length x $1-5 / 8^{\prime \prime} \times 1-5 / 8^{\prime \prime}$
Zinc plate with dichromate finish
11 pin Amphenol 86CP11
1 lb . approximately


| Line | TE 1286 |  |  | Drop | Drop Term |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Line Term | $\begin{aligned} & \text { Strap, } \\ & \text { or "C" } \end{aligned}$ | Strap |  |  |
| 600 | 1-4 | 2-3, 7-8 |  | 1500 | 6-9 |
| 500 | 1-4 | 2-3, 7-8 |  | 1500 | 5-10 |
| 150 | 1-4 | 7.8 | 1-3, 2-4 | 1500 | $6-9$ |
| 125 | 1-4 | 7.8 | 1-3, 2-4 | 1500 | 5-10 |

FUNCTION：
To provide mounting facilities for one power supply and two voice frequency（VF）Amplifiers or three VF Amplifiers．

## SPECIFICATIONS：

Mounting Provision for TLC 101 or 106 Power Supply：Mounted by two $6-32 \times 1-3 / 4$ screws．
Mounting Provision for VF Amplifiers：Two 11 pin octal sockets，three 11 pin octal sockets when power supply is mounted outside．
VF Amplifier Input and Output Connections：Screw type barrier strip．
Power Supply Connections：Screw type barrier strip．
Size： 10 long $x$ 6－5／16 wide $\times 3-1 / 2$ deep．
Weight：3－1／2 lbs．

## INSTALLATION：

1．Attach a power supply to the base of TLC 902，using two mounting screws furnished．
2．Connect red and white wires with spade lugs from power supply to terminals 14 and 13 respectively on barrier strip．
3．Make VF Amplifier external connections to barrier strip as shown in wiring diagram of TLC 902 ．
4．Install two VF Amplifiers（ 24 volts， $30-50 \mathrm{MA}$ or 48 volts， $30-50 \mathrm{MA}$ as required）by plugging them into the sockets．If only one VF Amplifier is used，a plug with dummy load should be provided in the unused socket． If power supply is not provided，a third VF Amplifier may be installed．
5．A grounding prong on the power cord plug is provided to ground the power supply．If a grounding type outlet is not available，use a 3 to 2 prong adaptor，and connect the grounding terminal of the adaptor to ground．Do not break off the grounding prong of the plug．


Mounting Dimensions


## APPLICATION：

Two models of Mounting Shelf are available．Catalog No．TLC 904 mounts 10 Webster VF Amplifiers in a 19 －inch relay rack；Catalog No．TLC 905 mounts 12 Webster VF Amplifiers in a 23 －inch relay rack．

## SPECIFICATIONS：

For use with：
Webster Voice Frequency（VF）Amplifiers，all models．
VF Amplifier Mounting Provisions：
TLC 904：
Horizontally mounts up to 10 VF Amplifiers side by side in 11－pin octal sockets．
TLC 905：
Horizontally mounts up to 12 VF Amplifiers side by side in 11－pin octal sockets．
Size：
TLC 904：
Requires 1 rack mounting space（ $1-3 / 4^{\prime \prime}$ ）in 19 ＇rack；6－1／8＇deep．
TLC 905：
Requires 1 rack mounting space（1－3／4＇＇）in $23^{\prime \prime}$＇rack；6－1／8＇＇deep．
Weight：
Two pounds．
ACCESSORIES：
Extractor Tool TLC 914：
Extracts VF Amplifiers from Mounting Shelf．

## INSTALLATION：

1．Fasten Mounting Shelf in relay rack，using four mounting screws（two on each side）：
2．Make VF Amplifier external connections according to appropriate figure on reverse side of this sheet or as required for type of amplifiers used．
3．Install desired number of VF Amplifiers by plugging them into sockets provided on Mounting Shelf．
4．To remove a VF Amplifier，use approved extractor tool that fits into flange holes at front of VF Amplifier．



FIG 4
SOCKET WIRING When power is fed to each amplifier SOCKET WIRING WHEN POWER IS FED TO EACH AMPLIFIER
SINGLY. MONITOR WINDINGS CONNECTED TO REAR PLUG.


FIG 5
SOCKET WIRING WHEN POWER IS FED TOEACH AMPLIFIER SINGLY SIMPLEX TAPS CONNECTED TO REAR PLUG

The TLC909 and 910 amplifier mounting shelves were designed to accommodate two TLC amp－ lifiers－NOT included－when up dating existing private line service by providing additional gain for long truck line．

The amplifiers are mounted vertically in the TLC909 shelf and horizontally in the TLC910． Both pre－wired units provide four jack facilities for testing voice frequency levels at inputs and outputs to the two amplifiers so that proper gain
for optimum performance may be easily adjusted at time of installation．

The shelves were designed specifically to mount in the Western Electric 1A1 Key Cabinet，or in any＂KS＂system using W．E．＂ 67 B ＂mounting rails．Each unit is supplied complete with screw type terminal board，four jacks with tip－ring cut－ off for measuring amplifier gain，and sockets and necessary hardware for mounting the TLC ampli－ fiers．

TLC 909 VERTICAL MOUNTING SHELF FOR 2 tLC AMPLIFIERS


note,

1. TLC TYPE AMPLIFIERS SHOWN ARE NOT PART OF
THIS ASSY.
2. SuPPLY vOLTAGE IS DETERMINED BY AMPLIFIERS
USED.
TLC 910 HORIZONTAL MOUNTING SHELF FOR 2 TLC AMPLIFIERS

## COMMUNICATIONS DIVISION WEBSTER W/ZLECTRIC COMPANY, INC.

FUNCTION:
Provide input and output jack facilities for TLC type VF amplifiers where mounted on TLC 912 or TLC 913 amplifier mounting shelf.

SPECIFICATION:
Eleven point plug wired to two double cut-off jacks to disconnect lines and permit connection to the input and output of the associated amplifier by means of test plugs. Zinc plating with dichromate finish.


## TLC 912 MOUNTING SHELF

FOR 5 TLC AMPLIFIERS AND 5 TLC 911 JACK ASSY'S.



## COMMUNICATIONS <br> DIVISION <br> amplifier mounting bracket TLC 915

## FUNCTION:

Provide mounting facility for a single TLC type VF amplifier in a standard apparatus box.

## SPECIFICATION:

One 11-point socket to accept VF amplifier plug. One 6-point barrier strip to provide screw type connections for input, output, and power leads. Two holes for mounting into apparatus box or other suitable fixture.


## FUNCTION:

The TLC916 mounting shelf is designed primarily as a companion mounting for increasing the capabilities of the Webster TLC736 2-4 wire terminating system. By use of this mounting, idle circuit termination, filters or other auxiliary equipment may be added to the 736 repeater system. For applicational drawing see Bulletin TE1384-3.

## SPECIFICATIONS:

The TLC916 mounting shelf is designed to mount in standard KTU mountings. The shelf, consisting of three 11 pin amphenol sockets, mates with plug-in modules using 86 CP 11 plugs. Each socket is wired through to a rear mounted screw type terminal strip. Supporting shelf type brackets are provided to support the plug-in modules. The unit is finished in telephone grey baked enamel.



## FUNCTION

The TE-1377B relay assembly is designed for use in the Webster TE-1377A repeater. It provides protection from ringing splash when Ring Down conversion to $\mathrm{E} \& \mathrm{M}$ or other types of signalling is employed.

## INSTALLATION

The TE-1377B relay has been designed for use only in the TE-1377B Webster repeater shelf. This shelf is a factory modified TLC737. Use of this relay in other repeaters may cause damage. Consult Webster Electric dwg., TE-1384-3, Fig. 302 for use of this relay in Webster Electric 736 repeater systems. This relay may be used in other 'Idle Circuit'" applications when appropriate wiring is provided.

The TE-1377Brelay is shipped with internal strapping for 24 VDC operation. If 48 VDC operation is desired, remove cover from TE-1377B and remove strapping around $R 2$ resister.

## OPERATION

Normally inserted in the 4 -wire transmit branch of the repeater, it provides a 600 ohm termination to the transmit circuit and opens the hybrid transmit circuit in the "Idle" condition. In the operated condition, "make before break" contacts complete the hybrid circuit to the 4 -wire transmit circuit and removes the 600 ohm termination. Contact arrangements are provided for proper operation from tie line trunk circuit or C. O. trunk circuits per Illinois Bell dwg., C5606-0100A.

Two wiring options are available, ' $D$ " and " $E$ ", these are for control wiring of tie trunks or $C$. $O$. trunks, and should only be used when dwg., C5606-0100A is called out.

A nylon screw in the front panel provides for mechanical operation of the relay.

## SPECIFICATIONS

Operating Voltage: 24 or 48 VDC at .040 Amp (internal strapping provides for 24 or 48 VDC operation)
Contacts: Twin, Palladium silver.
Controls: Front panel nylon screw mechanically operates relay.
Test Jacks: Accessible from front panel; (wired for "D' option testing).
Dimensions: $\quad 1-5 / 8^{\prime \prime} \times 1-5 / 8^{\prime \prime} \times 5-5 / 8^{\prime \prime}$ overall.
Weight:
$1-5 / 8^{\prime \prime} \times 1-5 / 8^{\prime \prime} \times 5-5 /$
Approximately 16 oz.
Color: Zinc plate with dichromate finish.
Plug:

$$
11 \text { pin, (Amphenol 86CP11). }
$$




NOTE:"SL" AND "B" LEADS CONNECT TO TIE LINE TRK CKT, C.O TRK OR AS SPECIFIED FOR RELAY OPERATION.
"E" AND "D" WIRING ARE OPTIONS.
"D" WIRING IS USED WITH C.O. TRK HAVING IDLE LINE
CKT CTRL MODIFICATION OF T-65781-II FIGI.
"E" WIRING IS USED WITH RING DOWN TIE TRK E/W SIG KEY ARRANGED TO DISABLE TRANS LOOP ON OUTGOING SIGNAL.

