

MICROPHONE COMPRESSOR (For ELECTRET MICROPHONE)

THE CIRCUIT SHOWN IS THAT OF A "MICROPHONE COMPRESSOR" ie.
AN AMPLIFIER CIRCUIT WHICH EXHIBITS GAIN, BUT CONTINUALLY ADJUSTS THAT GAIN,
TO MAINTAIN A REASONABLY CONSTANT AMPLITUDE, OUTPUT SIGNAL,
REGARDLESS OF THE AMOUNT OF SIGNAL COMING FROM THE MICROPHONE ITSELF.
ITS USES ARE MANY, IN THE AUDIO FIELD, PROBABLY THE MOST COMMON,
IS IN A BROADCASTING STUDIO (ETC) WHERE A CONSTANT AUDIO LINE LEVEL IS REQUIRED
REGARDLESS OF WHETHER THE ANNOUNCER'S VOICE BE LOUD OR SOFT.

THIS SIMPLE CIRCUIT IS EASY TO "GET WORKING" AND USES READILY AVAILABLE COMPONENTS.
THE CIRCUIT IS BASED ON A WELL KNOWN DESIGN;
EXCEPT I HAVE CHOSEN FOR THE ACTIVE CIRCUIT ELEMENT
TO BE A "SINGLE SUPPLY" OP-AMP (LM324)
AS OPPOSED TO THE MORE CONVENTIONAL TYPES WHICH REQUIRE
BOTH A +VE AND -VE SUPPLY VOLTAGE FOR THEIR OPERATION.
THIS MEANS THAT THIS CIRCUIT CAN BE OF MINATURIZED CONSTRUCTION
AND MAY BE INCORPORATED INTO THE MICROPHONE BODY ITSELF,
IT REQUIRES ONLY ONE EXTRA "CORE" WITHIN THE MIC' CABLE TO RUN A +12 VOLT DC SUPPLY FOR THE
ELECTRONICS.

THE CIRCUIT ACTION IS AS FOLLOWS:

I HAVE CHOSEN AN "ELECTRET" TYPE MICROPHONE INSERT BECAUSE OF THEIR SMALL SIZE,
EXCELLENT FREQ' RESPONSE, HIGH OUTPUT, AVAILABILITY AND CHEAP COST.
THESE SMALL "CAPSULE'S" USUALLY REQUIRE SOME SORT OF FOAM SHROUD
TO SUPPRESS MICROPHONE "POP"
I HAVE NOT TRIED ANY OTHER MIC TYPES ie. MAGNETIC, CERAMIC/CRYSTAL ETC
AS THE ELECTRET HAS ALL THE ABOVE ADVANTAGES.
THE MICROPHONE IS "AC" COUPLED TO THE OP-AMP

THE LM324 HAS 4 SEPARATE UNITS WITHIN THE PACKAGE, ONLY ONE IS REQ'D THE OTHERS ARE SIMPLY LEFT
DISCONNECTED
SEE MANUFACTURERS DATA SHEET FOR FULL PINOUT .
THE AMPLIFIED OUTPUT IS SAMPLED, RECTIFIED AND USED TO CHARGE A CAPACITOR
WHICH SUSTAINS A SMOOTHED DC VOLTAGE WHICH IS REPRESENTATIVE
OF THE AVERAGE SIGNAL AMPLITUDE.
THIS VOLTAGE IS USED TO CONTROL THE GATE OF THE "N" CHANNEL JFET
(types MPF 102 /105, J310 and 2N3189 ALL WORK)
AND HENCE ITS "ON" RESISTANCE.
BECAUSE THE JFET IS CONNECTED IN THE FEEDBACK PATH OF THE OP-AMP
IT CAN BE EASILY SEEN THAT THE OVERALL CIRCUIT GAIN CAN THUS BE "CONTROLLED"

I HAVE USED A "SHOTTKY" TYPE DIODE(S) FOR THE VOLTAGE DOUBLING RECTIFIER
SIMPLY BECAUSE OF THEIR LOW ON-STATE VOLTAGE DROP (290mv) ,
HOWEVER COMMON SMALL SIGNAL SILICON DIODES LIKE 1N4148 SHOULD WORK FINE AS WELL.
THE CIRCUIT PERFORMS BEST WITH THE ON-BOARD LOCAL +5V VOLTAGE REGULATOR,
SUITABLY DECOUPLED WITH 2.2 Mfd ELECTRO'S.
HIGHER SUPPLY VOLTAGES SEEM TO CAUSE DISTORTION AND PARALYSIS ON VOICE PEAKS?
THE TWO 47 Kohm RESISTIVE VOLTAGE DIVIDER IS USED TO ESTABLISH
AN OPERATING POINT; CONNECTED TO THE NON-INVERTING INPUT.

ADDITIONAL RELEVANT INFORMATION GLEANED FROM MANUFACTURERS DATA:

THE MICROPHONE DIAPHRAM IS AN "ELECTRET" MATERIAL:
AN INSULATING PLASTIC FILM POLARIZED BY A PERMANENT ELECTRIC CHARGE,
PRODUCED BY HEATING THE FILM AND THEN PLACING IT IN A STRONG MAGNETIC FIELD.
SINCE THE MICROPHONE CAPSULE IS EFFECTIVELY A SMALL CAPACITOR AT AUDIO FREQUENCIES, ITS IMPEDANCE
IS EXTREMELY HIGH;
ITS OUTPUT MUST BE FED TO (USUALLY) A FET SOURCE FOLLOWER INCORPORATED
INTO THE MICROPHONE CAPSULE WHICH ACTS AS AN IMPEDANCE TRANSFORMER
WITH AN OUTPUT "Z" OF A FEW HUNDRED OHMS.

THIS IS WHY YOU MUST SUPPLY DC VOLTAGE THROUGH AN EXTERNAL 10Kohm "DRAIN" RESISTOR, AND AC COUPLE
OFF, THE AUDIO SIGNAL.
THE LM324 IS A TRUE SINGLE SUPPLY OP-AMP
TO REDUCE THE POWER SUPPLY CURRENT DRAIN THE AMPLIFIERS HAVE A CLASS A OUTPUT STAGE FOR SMALL

SIGNAL LEVELS

WHICH CONVERTS TO A CLASS B IN A LARGE SIGNAL MODE.

FOR AC APPLICATIONS WHERE THE OUTPUT LOAD IS CAPACITIVELY COUPLED

TO THE AMPLIFIER A RESISTOR (10K) IS PLACED TO GROUND

TO INCREASE CLASS A BIAS CURRENT AND PREVENT CROSSOVER DISTORTION.

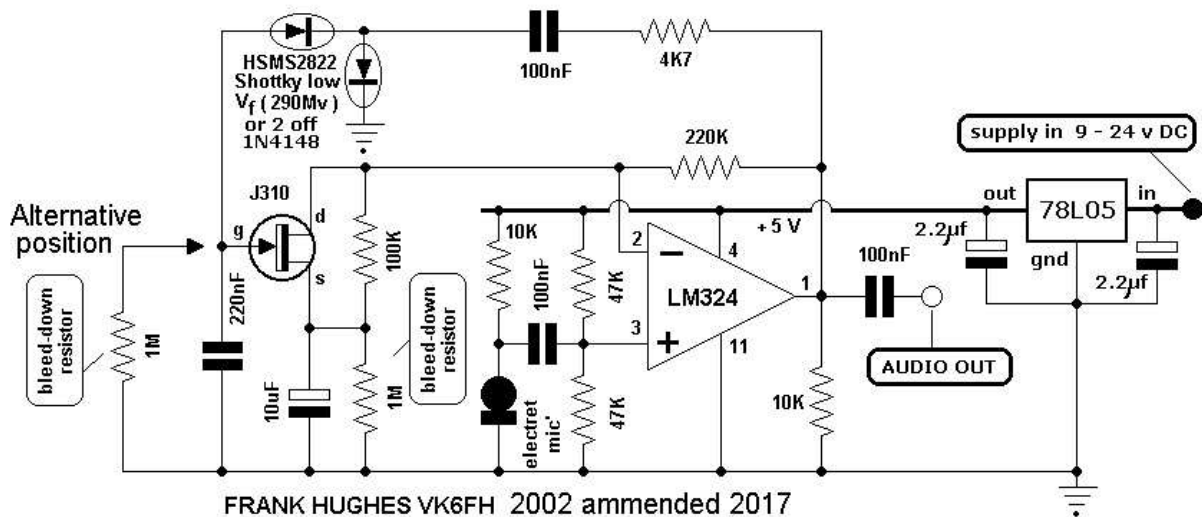
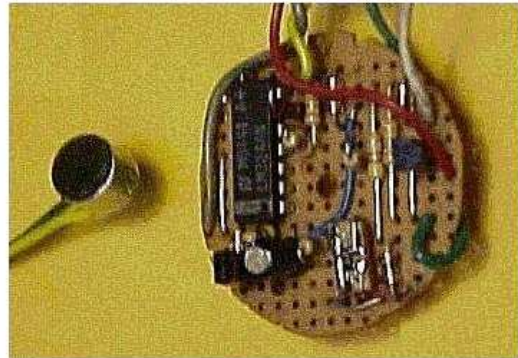
WITH DC COUPLING THERE IS NO CROSSOVER DISTORTION.

I HAVE HAD GOOD RESULTS WITH THIS DESIGN.

THE ATTACHED PIX SHOWS A PROTOTYPE CONSTRUCTED ON A PIECE OF "VEROBOARD" READY FOR INCLUSION INTO A MICROPHONE ENCASMENT.



Uses Single Supply
Op-Amp LM324



Update May 2017

From Dave Miller Princeton N.J. USA.

From experimentation an alternative position for the 1Mohm bleed down resistor, is from gate to gnd. This will recover the circuit quicker after lock-up due to sudden loud noise.....reports Dave.