DMC

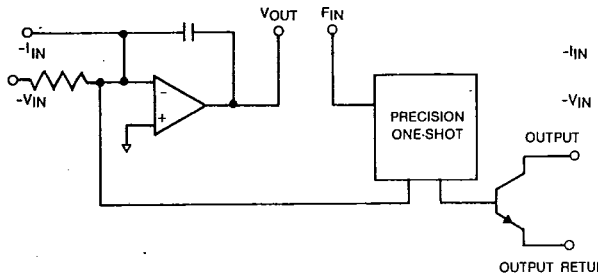
MODELS 3815, 3816, AND 3817 LOW COST, GENERAL PURPOSE V/F/V CONVERTERS

These are self-contained voltage-to-frequency converters, requiring no external components. Compared to typical V/F conversion systems assembled from monolithic V/F functions and additional components, they provide much better performance, with the ease and reliability of working with a single unit...often at lower cost and in less overall space.

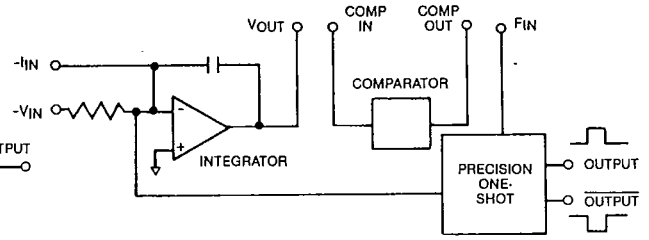
- V/F and F/V operating modes
- Single-supply operation (V/F mode)
- Max. non-linearities down to 0.005%
- Three full-scale frequency ranges:
  10 KHz - Model 3815
  25 KHz - Model 3816
  100 KHz - Model 3817
- Open collector, CMOS/TTL–compatible outputs (10 KHz, 25 KHz)
- Complementary CMOS output (100 KHz)
- Standard 14-pin hybrid package

BLOCK DIAGRAMS

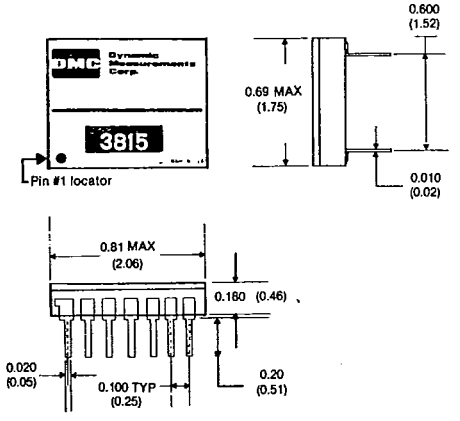
MODELS 3815 AND 3816



MODEL 3817



MECHANICAL DATA



PIN ASSIGNMENTS

MODELS 3815 & 3816			
PIN	FUNCTION	PIN	FUNCTION
1	NC	1	NC
2	$-V_S$	2	$-V_S$
3	I_{IN}	3	I_{IN}
4	V_{IN}	4	V_{IN}
5	V_{OUT}	5	V_{OUT}
6	F_{IN}	6	COMP IN
7	NC	7	NC
8	OUTPUT	8	$\overline{\text{OUTPUT}}$
9	OUTPUT RETURN	9	OUTPUT
10	NC	10	F_{IN}
11	NC	11	COMP OUT
12	COMMON	12	COMMON
13	NC	13	NC
14	$+V_S$	14	$+V_S$

Dimensions are in inches (cm) and tolerances are ±0.01 (0.025), unless otherwise specified.

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DMC

PERFORMANCE SPECIFICATIONS

(At +25°C, unless otherwise specified.)

PARAMETER GROUP	ITEM	SPECIFICATION						UNITS
		MODELS 3815 AND 3816			MODEL 3817			
		MIN	TYP	MAX	MIN	TYP	MAX	
ANALOG INPUTS (V/F OPERATION)	Range	0 to -10			0 to -10			VDC
	Configuration		Single-Ended			Single-Ended		
	Full-Scale Voltage[1]	-9.5	-10	-10.5	-9.5	-10	-10.5	VDC
	Full-Scale Current	126	133	140	126	133	140	uA
	Overrange	+10%			+5%			
	Input Impedance	70	75		70	75		Kohm
	Overvoltage Protection (without damage)			$\pm V_S$			$\pm V_S$	
DIGITAL INPUTS (F/V OPERATION)	Levels							
	Logic "1"	0.6	0.65	0.7		12V (CMOS-Compatible)		VDC
	Logic "0"	-0.1	0	0.3		12V (CMOS-Compatible)		VDC
	Pulse Width							
	3815	10	25	30				uSec
	3816	5	12	15				uSec
	3817				1	2.5	3	uSec
	Polarity		Positive			Positive		
SCALING AND OUTPUT	Full-Scale Frequency							
	3815		10					KHz
	3816		25					KHz
	3817					100		KHz
	Non-Linearity							
	3815		0.003%	0.005%				
	3816		0.005%	0.01%				
	3817					0.005%	0.015%	
	Output Pulse							
	3815	40	50	60				uSec
	3816	15	20	30				uSec
	3817				4	5	6	uSec
	Transfer Characteristic							
	F_{OUT} vs. V_{IN}: 3815		$10 \times (V_{IN}/10V)$					KHz
	3816		$25 \times (V_{IN}/10V)$					KHz
	3817					$100 \times (V_{IN}/10V)$		KHz
	F_{OUT} vs. I_{IN}: 3815		$10 \times (I_{IN}/133uA)$					KHz
	3816		$25 \times (I_{IN}/133uA)$					KHz
	3817					$100 \times (I_{IN}/133uA)$		KHz
	Polarity		Negative			Complementary		
	Levels		Open Collector			12V (CMOS-Compatible)		
STABILITY	Gain TC (0°C to 70°C)		60	100		40	200	ppm/°C
	Offset TC (0°C to 70°C)[2]		30	50		20	50	uV/°C
	PSRR: 3815, 3816		15	30				ppm/%
	3817					0.005	0.01	%/%
	Warm-Up Time (to 0.01%)		2			2		Minutes
POWER REQUIREMENTS	Single-Supply Operation							
	$+V_S$	14.5	15	25	14.5	15	20	VDC
	$+I_S$: 3815		7.9	10				mA
	3816		8.2	10				mA
	3817					10	14	mA
	Dual Supply Operation							
	$+V_S$	14.5	15	17	14.5	15	17	VDC
	$+I_S$		6.4	7.5		8.1	10	mA
	$-V_S$	-13	-15	-17	-13	-15	-17	VDC
	$-I_S$		3	4		2.5	4	mA
ENVIRONMENTAL	Operating Temp. Range	0		+70	0		+70	°C
	Storage Temp. Range	-25		+85	-25		+85	°C

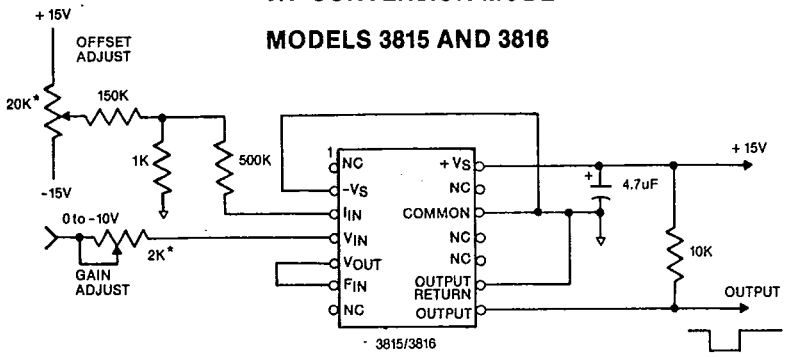
NOTES: 1. Specified with 1K resistor in series with V_{IN}. Trimmable to -10V.

2. Lower offset TC available in dual supply version. Please consult DMC.

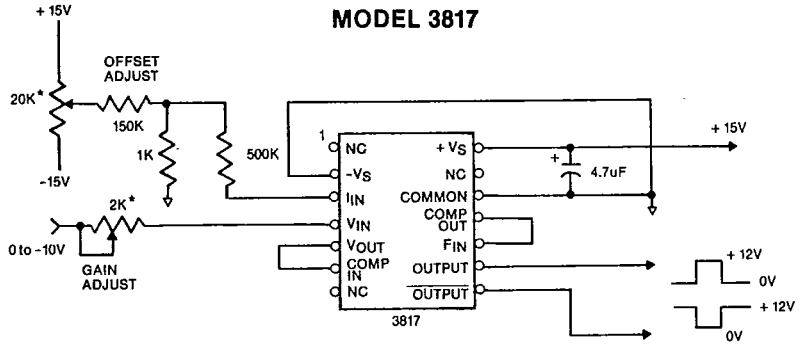
APPLICATION TECHNIQUES

V/F CONVERSION MODE

MODELS 3815 AND 3816

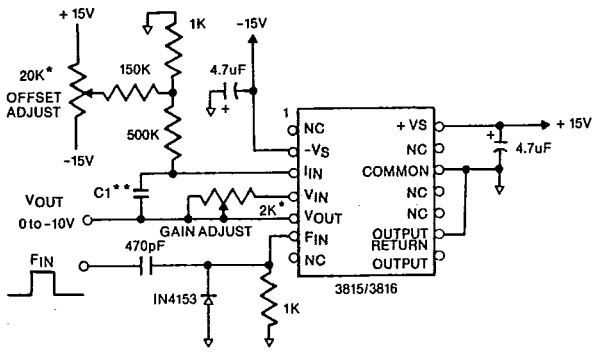


MODEL 3817

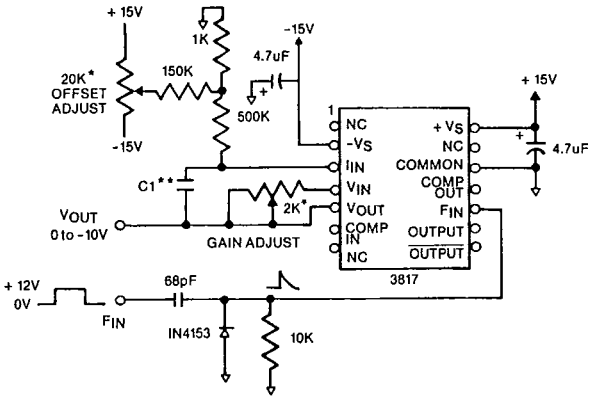


F/V CONVERSION MODE

MODELS 3815 AND 3816



MODEL 3817



* Stable, low TC 10T Potentiometer

** Capacitor C1 determines the amount of ripple and noise seen at the output. As step response and bandwidth are also a function of C1, care should be taken to calculate the value of C1 for the maximum amount of ripple that can be tolerated.This will ensure the best step response and bandwidth for the value of C. The formulas given below will give the worst case ripple (low frequency) for the selected value of C1. The graphs shown in Figures 1 and 2 may also be used to aid in the selection of C1.

10KHz Model 3815

$$V_{Ripple} = \frac{14.5 \times 10^{-9}}{C + 0.027uF}$$

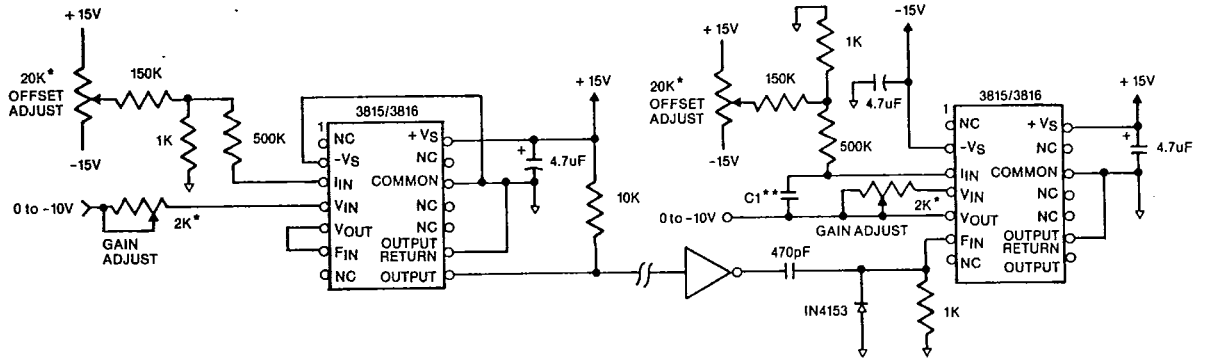
25KHz Model 3816

$$V_{Ripple} = \frac{7 \times 10^{-9}}{C + 0.015uF}$$

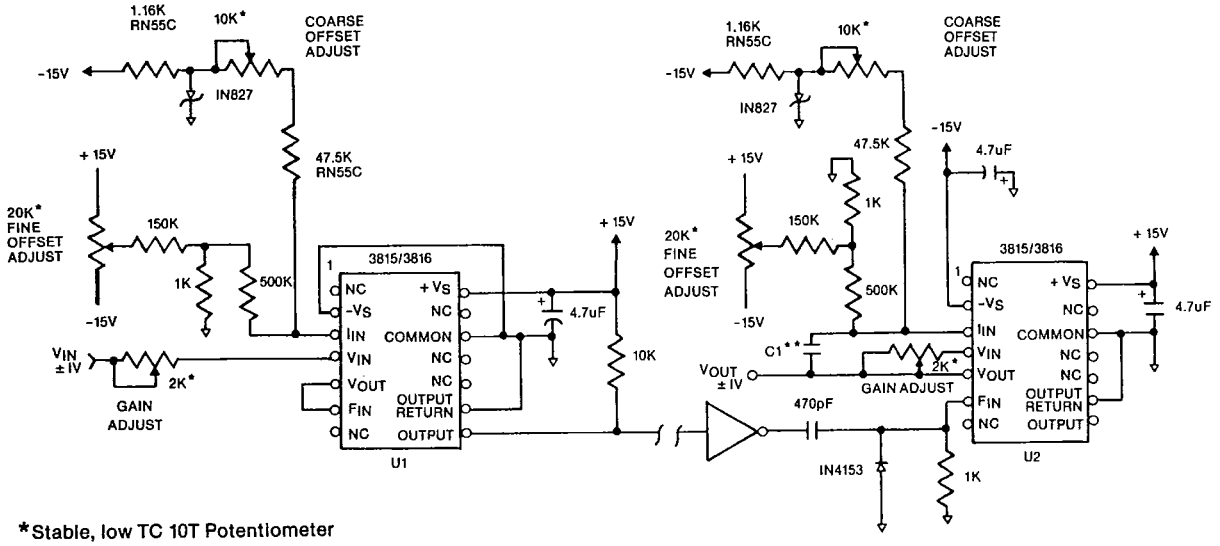
100KHz Model 3817

$$V_{Ripple} = \frac{1.4 \times 10^{-9}}{C1 + 0.0068uF}$$

0 TO -10V INPUT V/F-F/V LINK (UTILIZING MODEL 3815 OR 3816)



± 1V INPUT V/F-F/V LINK (UTILIZING MODEL 3815 OR 3816)



*Stable, low TC 10T Potentiometer

**Capacitor C1 is determined by using the formula shown for F/V conversion and the graphs shown in Figures 1, 2 and 3.

OPERATION

U1 is trimmed for a symmetrical change about 9KHz (MODEL 3815) or 22.5KHz (MODEL 3816) by using the Fine and Coarse Offset Adjustments to calibrate the center frequency. The Gain Adjust is used to center the frequency swing about the center frequency when ± 1V is applied. When ± 1V is applied to the transmitter (U1), the Gain Adjust of U2 is used to adjust for a 2V change in output voltage. Next the Coarse and Fine Offset Adjustments of U2 are used to center the 2V swing about 0. This gives a ± 1V output of the receiver (U2) when ± IV is applied to the transmitter (U1).

FIGURE 1

Typical Ripple vs Capacitance[1] 10KHz Link

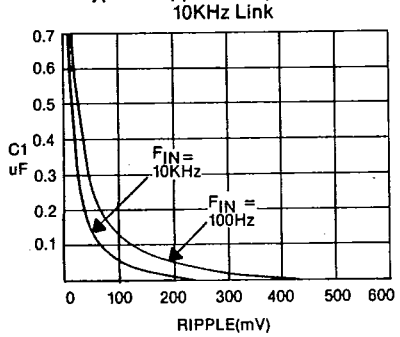


FIGURE 2

Typical Ripple vs Capacitance[1] 25KHz Link

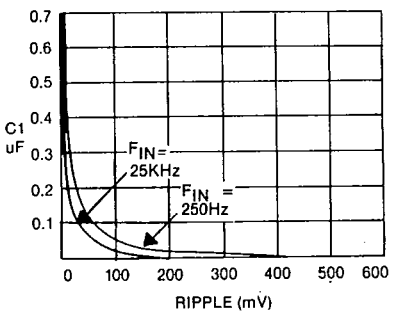
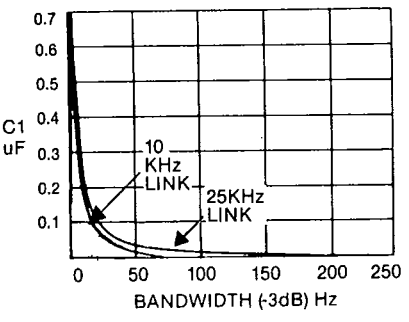


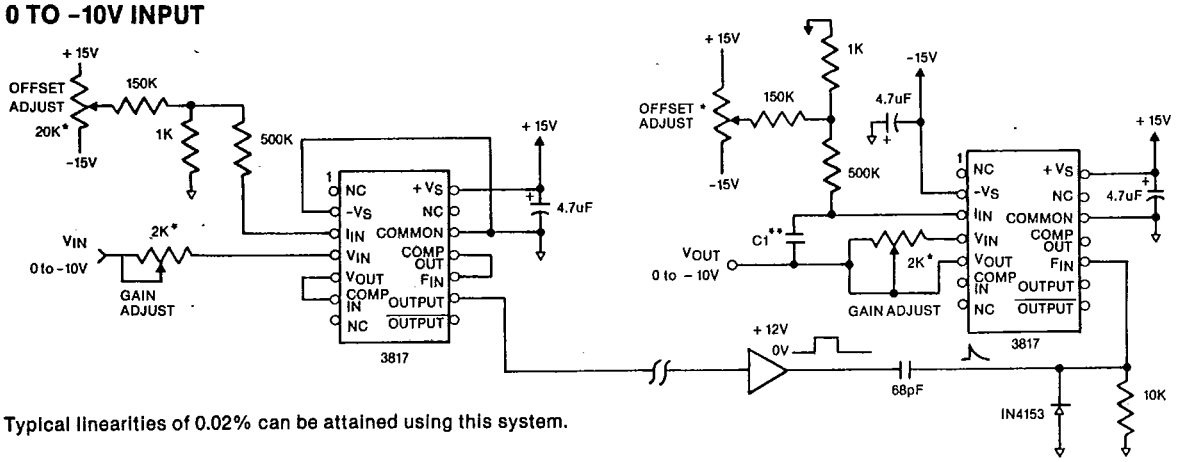
FIGURE 3

Typical Bandwidth vs Capacitance



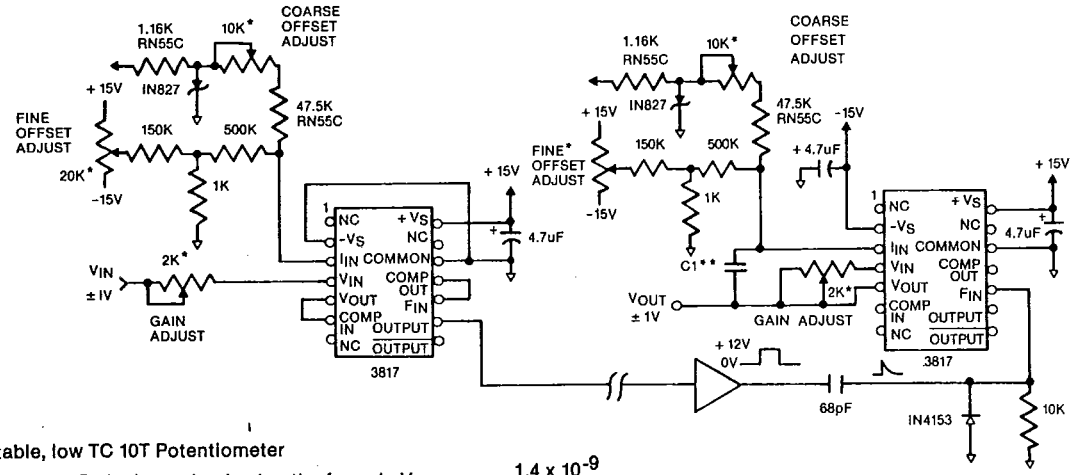
1 The range of ripple for a given value of capacitor is determined by the input frequency. The largest amount of ripple is seen at low frequencies while the least amount is seen at the Full Scale frequency (10KHz or 25KHz).

100KHz V/F - F/V LINK
0 TO -10V INPUT



Typical linearities of 0.02% can be attained using this system.

100KHz V/F - F/V LINK
± 1V INPUT



*Stable, low TC 10T Potentiometer

**Capacitor C1 is determined using the formula $V_{Ripple} = \frac{1.4 \times 10^{-9}}{C1 + 0.0068uF}$ and the graphs shown in Figures 4 and 5.

FIGURE 4
Typical Ripple vs Capacitance[1]
100Khz Link

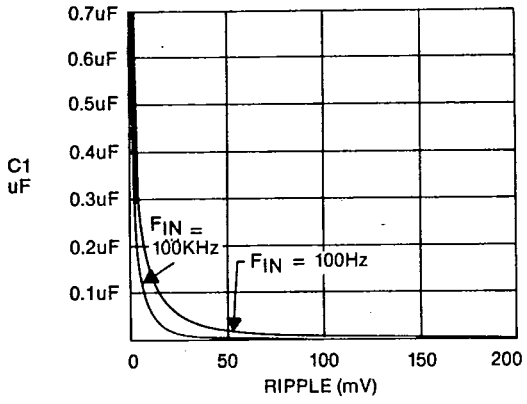
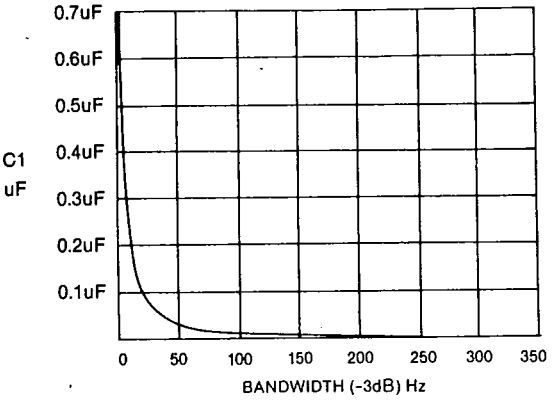


FIGURE 5
Typical Bandwidth vs Capacitance



1 The range of ripple for a given value capacitor is determined by the input frequency. The largest amount of ripple is seen at low frequencies, while the least is seen at 100KHz.