EXPERIMENT NO.1

OBJECT: To test the performance of Microprocessor controlled reversible DC drive using 1 phase SCR dual converter.

APPARATUS:-

1. UNEARTHED CRO 20 MHz with X10 probe or POWERSCOPE

2. True RMS DMM

3. Speed measuring Tachometer digital/analogue with or w/o contact type

4. Lamps- 15 ~40 W for Dummy Load & 100 W for DBR

   [We can set value 0 to 164 on thumbwheel for other values it will show error]

THEORY:- SCR controls for DC motors convert AC power to direct current, with adjustable voltage. Small DC drives are common in industry, running from line voltages, with motors rated at 90 V for 120 V line, and 180 V for a 240 V line. Larger drives, up to thousands of horsepower, are powered by three phase supplies and are used in such applications as rolling mills, paper machines, excavators, and ship propulsion. DC drivers are available in reversing and non-reversing models. The waveform of the current through the motor by a single-phase drive will have strong ripple components due to the switching at line frequency. This can be reduced by use of a poly phase supply or smoothing inductors in the motor circuit; otherwise the ripple currents produce motor heating, excess noise, and loss of motor torque.

PROCEDURE:

[USE POWERSCOPE OR UNEARTH CRO FOR OBSERVATION OF WAVEFORMS]

[For resistive load observations w/o motor you can connect a 40W lamp in field Test points & need not connect the Motor. The converter will not start w/o this lamp due to Field failure protection arrangement]

1. Connect the mains plug 3- pin top to 230 V AC mains socket.

2. Select FWD direction. Keep speed / alpha Thumbwheel at 164.

3. Connect the Jone's plug 8- pin top of motor in the output female socket tightly.
   [PIN 1 & 2 = ARM 1 PIN 3 & 4 = FIELD] pin5 & 6-generator voltage pin 7&8 generator field

4. Put a 40 W lamp in the backside load holder. This is a dummy load essential for latching current to SCRs better observation of waveforms.

5.   Switch ON the mains (SW1) rocker switch, Rocker SW glows, 'field ON' LED glows. ,
        Over current relay enabling green LED on O/C card glows, power supply LEDs glow. [if
        not, check fuses F1 and field fuse]

6.   Press start button, [if field is OK then only the relay RL1 will operate] ,

7.   Wait for motor response. Increase the SPEED/ALPHA pot clock wise. By setting angle
        with thumbwheel

8.   Press STOP, Change the direction to REV & press START. Motor stops slowly & then
        runs counter clock-wise...

9.   Press the stop button. Motor stop slowly due to kinetic energy in motor...

10.   Start the motor in either direction &run at full speed.

11.   Observe different waveforms on an UNEARTHED CRO with line trigger mode and two
        long probes to suit the test points. To avoid any short circuit do not observe power
        waveforms VA, VF, IA simultaneously.(Use 1:10 probe to observe power lest points)

OBSERVATION TABLE:-

   A) FIRING CHARACTERISTICS-

        Vary the thumbwheel position from 164 to 1 and note the firing ANGLE on CRO and vtg
        with a DMM. For Resistive load. i.e. with a Field Lamp of 40W & Dummy load of 40W.

THUMBWHEEL POSITION	O/P VOLTAGE DC Volts Panel meter	FIRING ANGLE DEGREES/mSec CRO
164		
150		
130		
90		
70		
50		
30		

B) SPEED CHARACTERISTIC.

Vary the thumbwheel position from 164 to 1 and note the.'speed' by using Tachometer and output voltage from Panel meter. Current reading from Panel meter.

THUMBWHEEL POSITION	O/P VOLTAGE DC Volts Panel meter	O/P Current DC ammeter on Panel	SPEED (RPM)
164			
150			
130			
90			
70			
50			
30			

PRECAUTIONS:

A. Use unearthed CRO for observation.

B. Do not touch the test points or CRO to avoid SHOCKS.

C. Do not touch any component in the circuit during operation.

D. Keep the table clean. Do not handle any piece of wire to avoid any short circuit on the circuit board when the shutter is open.

E. Do not disturb any preset on control cards.

F. Do not change the fuse ratings

RESULT:-

TEST POINTS

TP 1	:	+5V PS
TP 2	:	ZCD
TP 3	:	Direction Card CLK pulse
TP 4	:	Interrupt RST 6.5
TP 5	:	Gated output FWD
TP 6	:	Gated output REW
TP 7	:	Error
TP 8	:	Chopped pulse FWD
TP 9	:	Chopped pulse REV