FOR MODEL 403D MANUAL

ROTARY CHAIR SYSTEM

WITH

GENERAL EYE ELECTRONICS

IM-5312

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SYSTEM WITH GENERAL EYE ELECTRONICS

1.0 INTRODUCTION

The Manual Rotary Chair System consists of a Model 403D Chair Controller, a rotary chair assembly, and eye monitoring electronics. The controller is computer controllable and is capable of driving the 20-ft-lb motor to which the chair is attached. The eye monitoring electronics provide up to four channels of eye position output.

1.1 STIMULUS CONTROL

The Model 403D Chair Controller accepts a digital or analog rate command and uses a 15-ampere power amplifier configured in a servo feedback loop to drive a 20-ft-lb motor to which the patient chair is attached. Tachometer output is presented for monitoring the chair rate. In addition, various safety circuits are employed to prevent the motor from being turned on if proper conditions are not met or to turn off the motor if certain overspeed conditions occur.

The 403D Chair Controller includes three buffers for driving light emitting diodes useful in calibrating the patient’s eye movement. A spare latch circuit is also present for use in patient alerting schemes.

1.2 PATIENT RESPONSE MONITORING

Electronics capable of providing up to four channels of eye position output are mounted on the rotating portion of the chair assembly. Minute voltages proportional to eye position are detected by skin electrodes. The electrode signals are amplified through isolation amplifiers and then passed through further amplification and noise cancelling circuity. The position outputs pass through the chair assembly slip rings and are presented for monitoring at the 403D.

1.3 SPECIFICATIONS

MAXIMUM SPEED 100 deg/sec

(rate trip limited)

INPUT DIGITAL SCALE FACTOR 0.024 deg/sec/bit

Resolution 13 bits

Offset binary format;

Positive = CW rotation

INPUT ANALOG SCALE FACTOR 5 deg/sec/volt

Range +/- 20 V

+Volts = CW rotation

SPEED ACCURACY 0.1% +/- 0.01 deg/sec

PEAK TORQUE 20 ft-lbs

SERVO BANDWIDTH 700 pounds

INPUT POWER 115 +/- 10% VAC, 50/60 Hz, 600 VA

DIGITAL INPUTS TTL compatible

ANALOG INPUTS impedance > 20 Kohms

EYE POSITION SCALE FACTOR 10 deg/volt nominal

2.0 OPERATION

2.1 CHAIR CONTROLLER

2.1.1 POWER

Power to the Model 403D Controller is provided by a cable that plugs into a standard 115 VAS single-phase outlet (700VA service minimum). Power is controlled by the front panel AC ON/AC OFF switch and protected by a 6.25-ampere line fuse (FL). The light above the AC ON/AC OFF switch is lit when power is supplied to the controller.

2.1.2 RATE CONTROL

Chair rate is controlled in one of two ways. A digital word may be presented to J3 or an analog signal may be presented to TB1. Enabling the digital command word is controlled by the DAC Enable/Disable control line. If this line is “SET” the output of the D/A is enabled to control the rate. If this line is “RESET” the input to the D/A will have no effect on the chair rate. In this mode the analog rate command should be used.

2.1.3 CONTROL INTERLOCK

To assure the presence of all control signals the Model 403D is equipped with an interlock circuit that prevents power from being applied to the motor unless all the following conditions are met:

1. A connector is attached to J3 which provides 5V at 20mA between Pins L (+) and A.
2. A connector is attached to J6 which provides 5V at 20mA between Pins M (+) and N.
3. The SERVO On/Off line is “SET”.

When all these conditions are met 10 seconds elapse due to the internal time delay of the motor control relay before power is applied to the motor.

2.1.4 RATE INTERLOCK

To prevent the chair from turning faster than the preset level of 100 deg/sec, rate interlock circuitry removes power from the motor if any of the following occurs:

1. The tachometer voltage exceeds a preset level corresponding to a rate of 100 deg/sec in either CW or CCW direction.
2. The INERTIA switch mounted on the chair experiences centripetal force corresponding to a rate in excess of 150 deg/sec.
3. Any of the turn-on conditions are removed.

2.1.5 INTERLOCK RESET

If power is removed from the motor due to overspeed conditions, the interlock circuitry will recognize that an abnormal condition has occurred. This abnormal condition may be detected by external equipment as a HIGH TTL level on Pin M of J3. When this condition occurs the 403D must be reset by turning the controller off using the front panel switch. The controller must be left off for a minimum of 30 seconds before turning it on.

2.1.6 OUTPUT FUSE

The motor is protected from an overcurrent condition by a 15-ampere fuse (F2).

2.1.7 TACHOMETER

\*NOTES ON PAGE\* [Pins A and B are of J4]

The tachometer signal is buffered and available at Pins A and B of J5 for monitoring the exact rate of the chair. For calibration purposes a TTL pulse is available at J8 that occurs once per revolution of the chair.

2.1.8 SPARE LATCH

\*NOTES ON PAGE\* [Contact closure is at J4-5, not J7]

As a matter of user convenience, a spare latch circuit exists. A contact closure at J7, Pins K and L on the 403D will cause a HIGH TTL level to occur and remain at Pin N of J3 until reset by a HIGH TTL level at Pin K of J3.

3.0 STANDARD CHAIR TEST OPERATION

The normal testing of patients with the Model 403D rotary chair system (less the central processing unit) requires the following auxiliary equipment:

1. A signal generator capable of producing sine waves with very low harmonic distortion (0.01% THD) in the frequency range of 0.01 Hz to 0.2 Hz.
2. A strip chart recorder or other means of recording at least two channels of information varying with time over 400 seconds.
3. Small silver-silver chloride skin electrodes attached to the patient in a typical END fashion using good electrode technique.
4. A switch box and/or break-out box for accessing the analog output signals and control lines of the Model 403D.

The phase error produced by the General Eye Electronics at the five frequencies of interest (namely, 0.01, 0.02, 0.04, 0.08, 0.16 Hz) may be needed to reduce the results of the data. These numbers may be approximated by using the following formula:

Phase error = ft x 10.4 (where ft is the test frequency)

At 0.2 Hz the phase error is roughly 2. If the user needs greater precision, the exact error may be measured at the frequencies of interest.

3.1 TEST PROCEDURE

\*NOTE\* [Using the analog voltage from the signal generator to control the rate of the chair requires that the digital input be disabled and the interlocks satisfied. The generator should be set for a sine wave with an amplitude of 10V p-p for a maximum rate of +/- 50 deg/sec and the appropriate test frequency.]