ELLIOTT

ADJUSTABLE LAP HYDRAULIC CONTROL VALVES

In conventional hydraulic control valve practice the production effort required to achieve ideal mechanical form, and hence high performance, is often prohibitive. Production of small valves is particularly difficult even when all pretence to linearity has been sacrificed. To overcome the mass-production problem and simultaneously to improve upon present-day best performances a new valve arrangement has been evolved. This, the Adjustable Lap System, offers the following advantages:

(i) Straight line characteristic (see overleaf) giving uniformly high loop-gain at all amplitudes.

(ii) Facility for fine adjustment of the lap to any desired value during operation.

(iii) Zero lap can be achieved readily (within 10^{-4} in.).

(iv) Low spool inertia.

Considerable benefits have been shown to arise in practice from all of these factors. For more detailed information Publication S.24 is available upon request.

The standard types are:

TYPE B 603B (*all connections by face seal*).

TYPE B 603R (*one face seal, two* $\frac{1}{4}$*" B.S.P. unions*).

Both types embody Class A locking, for flying controls, when required. (Other types are also made.)

PERFORMANCE FIGURES

TYPE: 3-way Control Valve for differential operation.

WEIGHT (steel): 1.7 lb.

FLOW AND GAIN

Supply Pressure	1,000 p.s.i.		3,000 p.s.i.	
Impedance	High	Low	High	Low
Approx. rated max. flow (cc/sec)	85	85	120	120
Approx. overall gain (cc/sec/mA)	3.75 ±15%	0.47 ±15%	5.60 ±20%	0.70 ±20%

INTERNAL LEAKAGE (cc/sec)

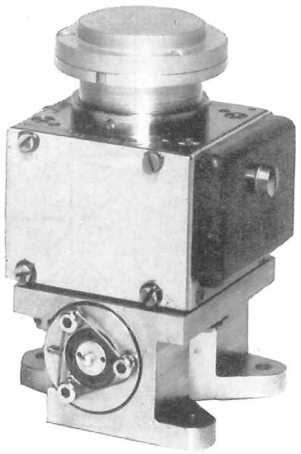
Test Fluid: Shell Tellus 27 at approx. 70 cS viscosity.

Supply Pressure		1,000 p.s.i.	3,000 p.s.i.
P_S to jack		1.5	4.5—5.5
Jack to exhaust	thro' valve	1.0	3.0—4.0
	via shaft	0.5	1.5

Dither Level: <0.01 radian p.p. at the driving shaft.

Rated Driving Shaft Deflection: ±0.10 radian at full differential current.

Rated Valve Deflection: ±0.004 in. at ±0.10 radian shaft deflection.



Type B 603B

WINDINGS: Four types are standard	"Normal"		Wider temperature range	
	High Z	Low Z	High Z*	Low Z
Rated max. differential current (mA)	20	160	20	160
Resistance, 2 coils each (ohms)	10k	140	12.5k	180
Inductance, 2 coils each (mH)	15,000	610	15,000	450

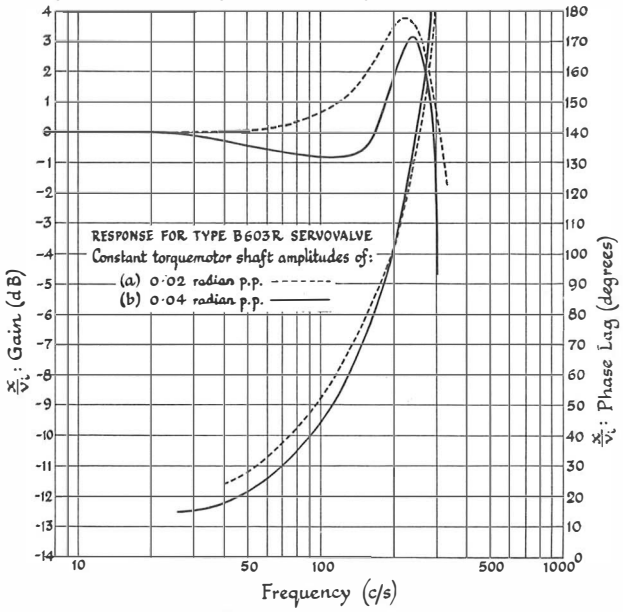
* *provisional*

Note: Valves Types B 603 B and R, with wider temperature range motors, are known as Types B 603BW and B 603RW.

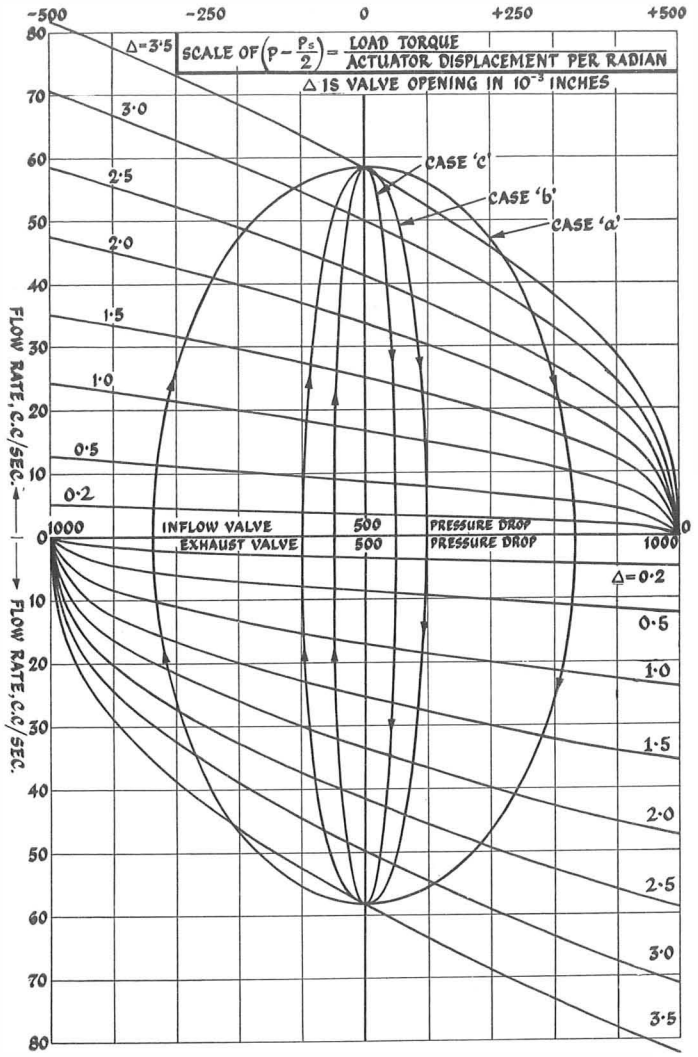
Connections: Two coils in series, centre tap to h.t., ends to push-pull drive. Standing current, centre to ends, equals half maximum differential current.

TYPICAL OPEN LOOP FREQUENCY RESPONSE, TYPES B 603B and B 603R

The frequency responses shown were taken from a Type B603R servovalve with high-impedance torquemotor. The supply port was connected to a line at 1,000 p.s.i., the jack port to a line at 500 p.s.i., and the exhaust port was substantially open. The responses were taken between V_i, the driving amplifier input voltage, and x, the demodulated pick-off signal. The current/flow response normally peaks at a frequency some 50 c/s higher.



The A.C. pick-off (optional extra) and its demodulator can be successfully operated at any frequency up to at least 20 kc/sec. When it is employed to close a local loop around the torquemotor the electrical linearity of the torquemotor becomes comparable with the hydraulic linearity of the valve.



(ABOVE)

Sinusoidal cycles for a 3-way valve controlling a pure inertia load (no actuator friction).

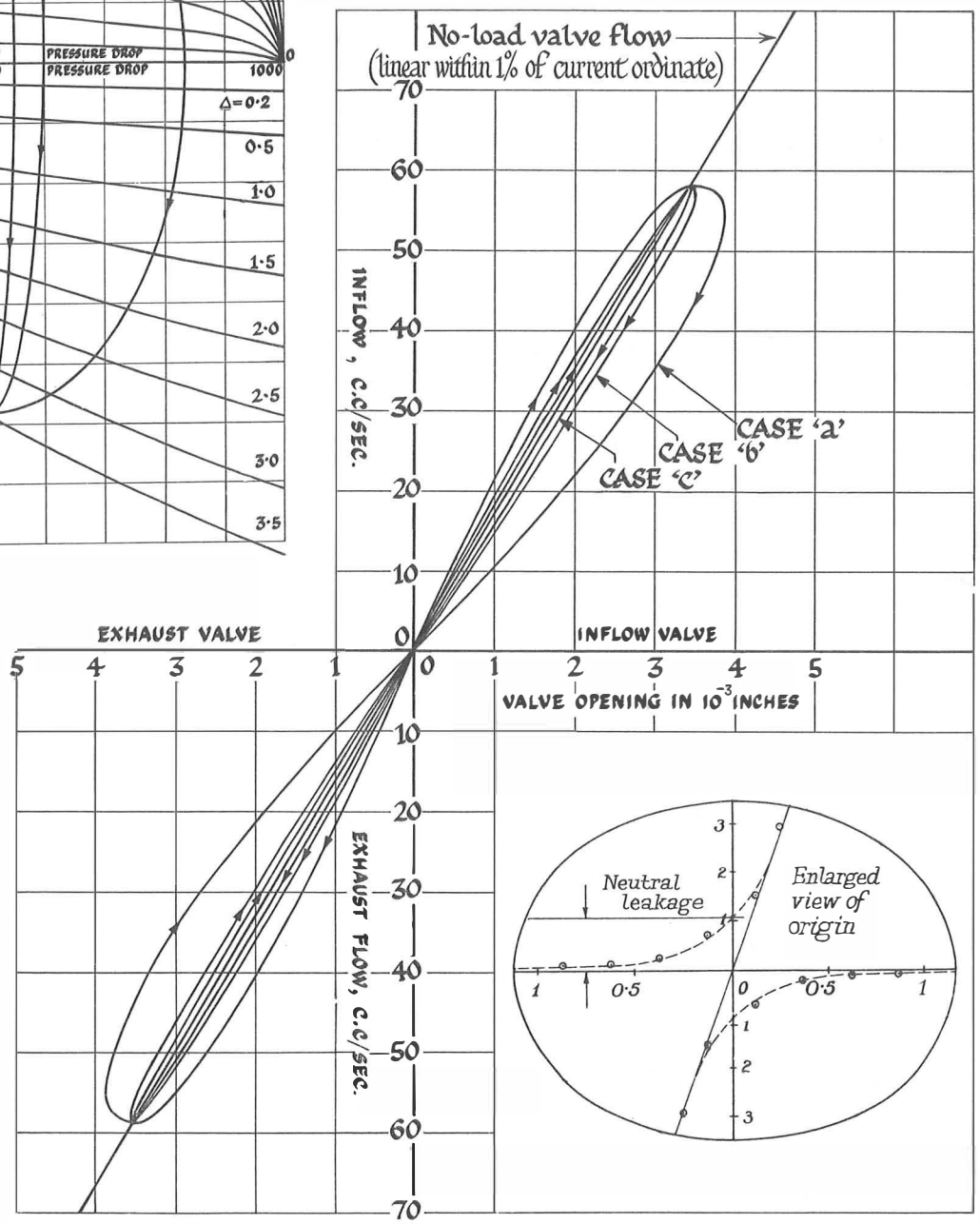
Example: Supply pressure P_s = 1,000 p.s.i. Differential actuator has a displacement per radian of 6.3 cc ≡ 0.384 cu.in. Inertia of load 10^5 gm. cm^2 ≡ 34.2 lb.$in.^2$. For other parameters see table above right.

(BELOW)

Flow variations corresponding to sinusoidal cycles for a 3-way valve controlling a pure inertia load (no actuator friction).

Example: Supply pressure P_s = 1,000 p.s.i. Differential actuator has a displacement per radian of 6.3 cc ≡ 0.384 cu.in. Inertia of load 10^5 gm.$cm.^2$ ≡ 34.2 lb.$in.^2$. For other parameters see table below.

Case	Load Amplitude $\pm\theta$ Radian	Load Oscillation Frequency fc/s	Peak Load Velocity $2\pi f \times \theta$ Radn/Sec.
" a "	0.06	24.75	9.33
" b "	0.20	7.40	9.33
" c "	0.40	3.70	9.33



ELLIOTT BROTHERS (LONDON) LTD. · GUIDED WEAPONS DIVISON
ELSTREE WAY, BOREHAMWOOD, HERTS
Tel : Elstree 2040

Printed in England