Avionics Research Products

Mk. I Integrater

description + operation + application + maintenance + specification

A.R.P. Mk I ~~It~~ integrator performs the function of summation or integration with respect to time on any voltage applied to its input - This voltage may be any analog representation of any quantity. Integration time constants of .5, 1. and 2. seconds are provided. In addition capacitors of and ~~v~~fd. may be inserted in series with the integrater to allow operation on variations of input voltages while neglecting any ~~steady~~ constant quantities present. A ~~zero~~ push ~~p~~ button allows ~~the~~ instantaneous zeroing of output - ~~Operation~~ Drift is held to an extremely low value so that operation may be continued almost indefinitely without appreciable error - An ~~po~~ ~~in~~ impact resistant, polyester-fibre glass case houses the instrument -

600
.02
12,00

Specifications ~~are~~:

Input power - 115 V 60 ~ 1 ϕ - 35 watts

Max ~~Sign~~ Output - High - ± 100 V at 50 KΩ impedance

Integrater P-2

Low - ±1 volt at 500 Ω

Drift - less than 1 volt/24 hrs at high output -

Integration time - less than 10^{-4} sec -

" Accuracy - greater than 1%

Insert Controls Here

This unit performs the function of integration as follows -

$$*e_{out} = \frac{1}{RC}\int_{T_1}^{T_2} e_{in}$$

where e_{in} is the value of a time dependent variable voltage, e_{out} is the value of the voltage at the 'high' output jack, T_1 is the time in seconds at beginning of an integration period, T_2 is the time in seconds at the end of a period and $1/RC$ is the time constant in seconds - Since maximum e_{out} is limited to ± 100 volts, the values of e_{in}, $1/RC$ and length of time from T_1 to T_2 must be chosen so that $e_o = \pm 100$ volts is not exceeded and yet provide a reasonable working value -

For example suppose that a steady state voltage of +1 volt was applied to of e_{in} was

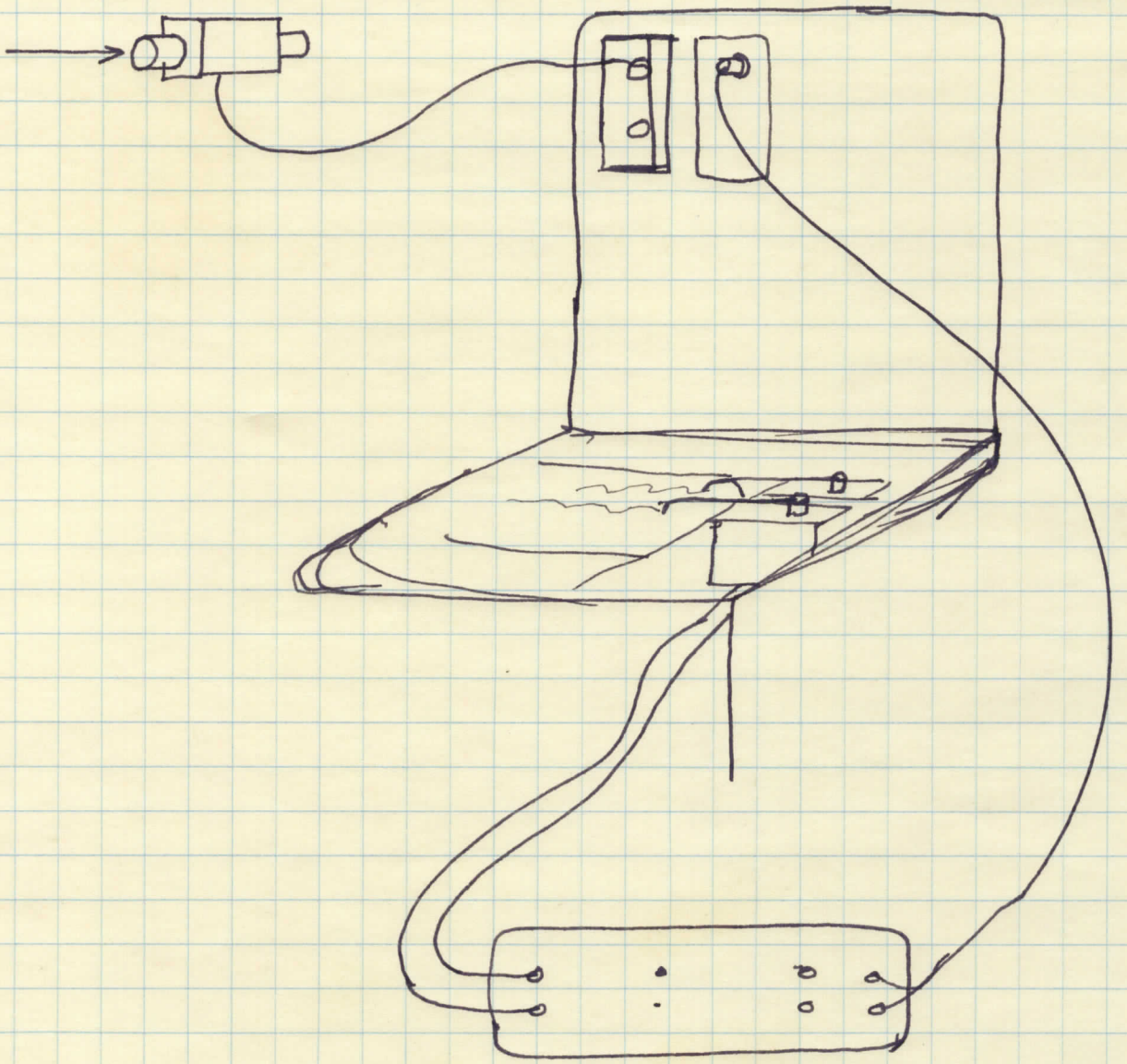
* referred to high output jack -

is to be integrated. With a value of $1/RC$ or K of .5 the maximum time that may be allowed from T_1 to T_2 is 200 second. (Fig I) With $K = 1$ and 2, integration times of 100 and 50 respectively are the maximum available. Generally speaking functions values of less than .05 to .1 volt maximum should not be integrated directly but should be further amplified before application to the integrater.

One of the most common applications of this device is in data recording where it is desired to record directly the area under a curve. This curve could be the rate of flow of some quantity while the instantaneous volume is also desired. In such a case it is only necessary to apply a voltage analog of the flow rate signal to the E_{in} terminals of the integrater and take E_o from a voltage analog of the quantity from E_o.

A typical example of such an arrangement is shown in Fig II.

P-4 Integrater



A commonly used recorder, the Offner is shown with channel one connected to a flowmeter. Flow rate will be recorded on channel #1 and an analog ~~of~~ voltage of the rate derived from ~~the bottom of the~~ input terminal of the pen motor at the bottom of ~~the~~ its magnet assembly. A ground connection should be ~~provided~~ made

on the pen motor - The pen voltage is applied to the input E_{in} (*) In order to ~~use the~~ ~~con~~ maintain the ~~steady-s~~ steady state levels accurately (~~connect~~ coupling capacitor set to ∞) it is necessary to carefully zero the flow rate channel. Otherwise any deviation from zero will summed over a period of time and appear as a slow drift of the integrator channel.

(*) Output of the

Control