Air Data Computer

Pressure Altitude h_p

fino a 11.000 metri

$$\frac{p_s}{p_{s_0}} = \left(1 + \frac{a h_p}{T_0}\right)^{\frac{-g}{aR}} \Rightarrow \quad p_s = p_{s_0}\left(1 + \frac{a h_p}{T_0}\right)^{\frac{-g}{aR}}$$

$$p_s = 101.325\left(1 - 2.25577 \times 10^{-5} h_p\right)^{5.2559} \quad \text{kPa}$$

oltre 11.000 metri

$$\frac{p_s}{p_{s_T}} = e^{-\left(\frac{g}{RT_T^*}\right)(h_p - h_T)} \Rightarrow \quad p_s = p_{s_T}\, e^{-\left(\frac{g}{RT_T^*}\right)(h_p - h_T)}$$

$$p_s = 226.32 e^{-1.576 \times 10^{-4}(h_p - 11000)} \quad \text{kPa}$$

Look-up table

Calibrated Air Speed v_{CAL}

campo subsonico

$$p_d = p_{s_0}\left[\left(1+\frac{\gamma-1}{2}\frac{v_{CAL}^{\,2}}{c_0^{\,2}}\right)^{\gamma/\gamma-1}-1\right] \Rightarrow p_d = q_c = 101.325\left[\left(1+0.2\left(\frac{v_{CAL}}{340.294}\right)^2\right)^{3.5}-1\right] \text{ kPa}$$

campo supersonico

$$\Delta p = p_{s_0}\left(\frac{v_{CAL}^{\,2}}{c_0^{\,2}}\frac{\gamma+1}{2}\right)^{\frac{\gamma}{\gamma-1}}\left(\frac{\gamma+1}{2\gamma\frac{v_{CAL}^{\,2}}{c_0^{\,2}}-\gamma+1}\right)^{\frac{1}{\gamma-1}}-1$$

$$q_c = 101.325\left[\frac{166.92\left(\frac{v_{CAL}}{340.294}\right)^7}{\left(7\left(\frac{v_{CAL}}{340.294}\right)^2-1\right)^{2.5}}-1\right] \text{ kPa}$$

Vertical Speed $\dot{H}_p$

fino a 11.000 metri

$$dh = -\frac{RT}{g}\frac{dp}{p} \quad \Rightarrow \quad \dot{H}_p = -\frac{RT}{g}\frac{\dot{p}_s}{p_s}$$

$$\dot{H}_p = 8434.51\left(1 - 2.255x10^{-5}H_p\right)\frac{\dot{p}_s}{p_s} \quad m/s$$

oltre 11.000 metri

$$\dot{H}_p = 6341.62\frac{\dot{p}_s}{p_s} \quad m/s$$

Mach number $\mathbf{M}$

campo subsonico

$$\frac{\mathbf{p_t}}{\mathbf{p_s}} = \left(1 + 0.2\mathbf{M}^2\right)^{3.5}$$

campo supersonico

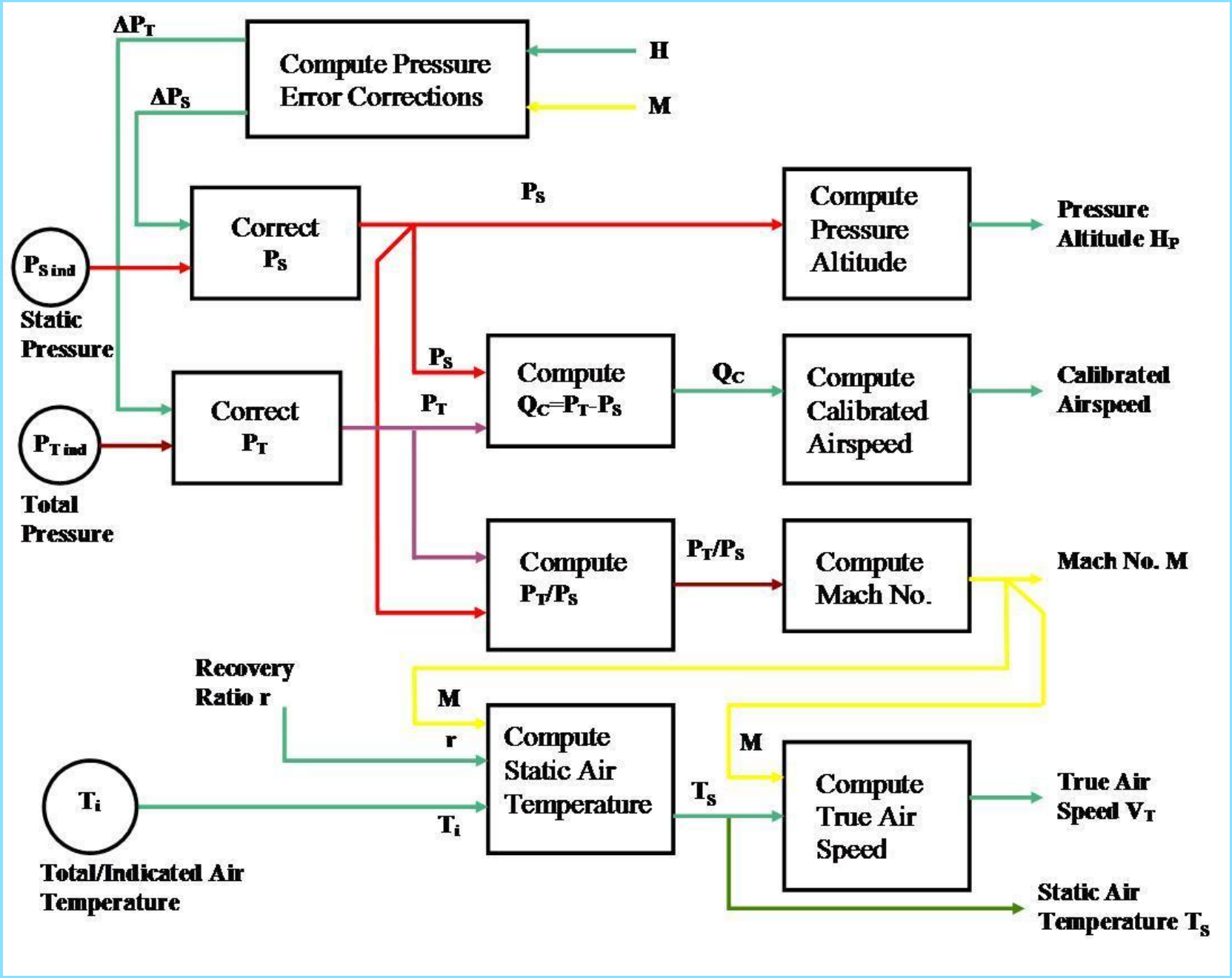
$$\frac{\mathbf{p_t}}{\mathbf{p_s}} = \frac{166.92\mathbf{M}^7}{\left(7\mathbf{M}^2 - 1\right)^{3.5}}$$

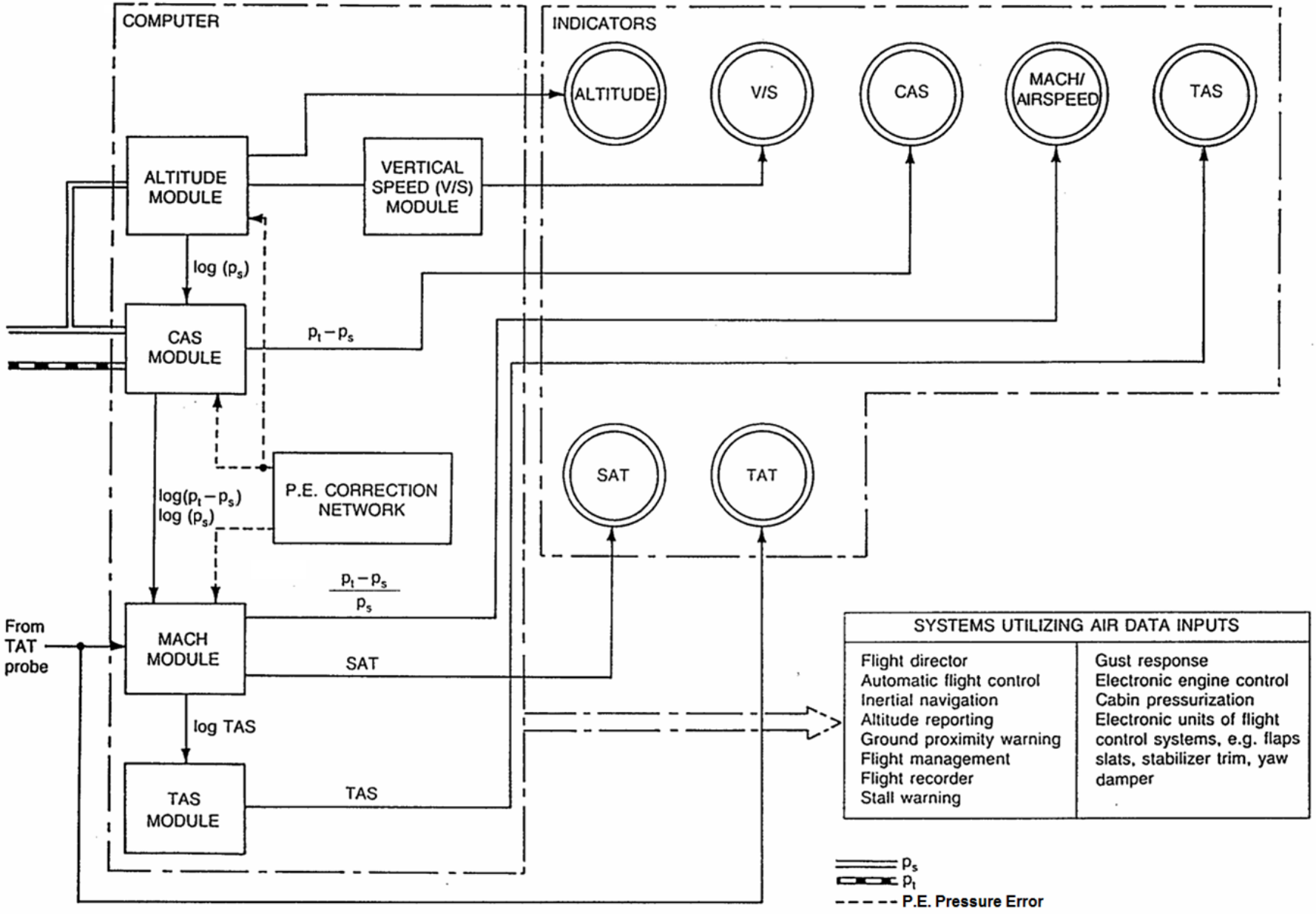
Static Air Temperature $\mathbf{T_s}$

$$\mathbf{T_s} = \frac{\mathbf{T_m}}{1 + 0.2\mathbf{r}\mathbf{M}^2} \quad {}^{\circ}\mathrm{K}$$

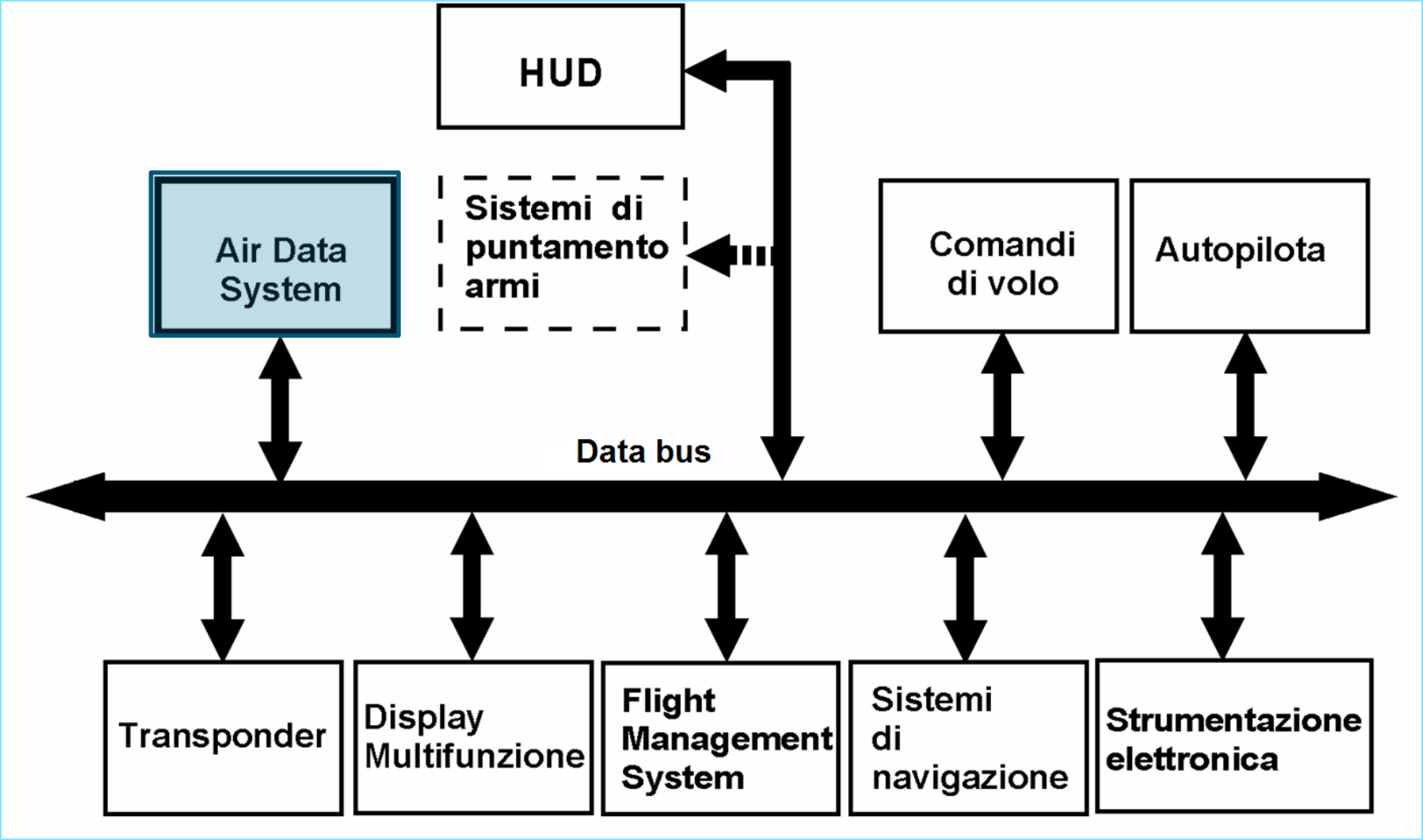
True Air Speed $\mathbf{v}$

$$\mathbf{v} = 20.0468\mathbf{M}\sqrt{\mathbf{T_s}} \quad \mathrm{m/s}$$


ΔPT
ΔPS
Compute Pressure Error Corrections
H
M
PS ind
Static Pressure
Correct PS
PS
Compute Pressure Altitude
Pressure Altitude HP
PT ind
Total Pressure
Correct PT
PS
PT
Compute QC=PT-PS
QC
Compute Calibrated Airspeed
Calibrated Airspeed
Compute PT/PS
PT/PS
Compute Mach No.
Mach No. M
Recovery Ratio r
M
r
Compute Static Air Temperature
Ti
Ti
Total/Indicated Air Temperature
Ts
M
Compute True Air Speed
True Air Speed VT
Static Air Temperature TS


COMPUTER
INDICATORS
ALTITUDE
V/S
CAS
MACH/ AIRSPEED
TAS
ALTITUDE MODULE
VERTICAL SPEED (V/S) MODULE
log (ps)
CAS MODULE
pt − ps
SAT
TAT
P.E. CORRECTION NETWORK
log(pt − ps)
log (ps)
pt − ps / ps
From TAT probe
MACH MODULE
SAT
log TAS
TAS MODULE
TAS
SYSTEMS UTILIZING AIR DATA INPUTS
Flight director
Automatic flight control
Inertial navigation
Altitude reporting
Ground proximity warning
Flight management
Flight recorder
Stall warning
Gust response
Electronic engine control
Cabin pressurization
Electronic units of flight control systems, e.g. flaps slats, stabilizer trim, yaw damper
ps
pt
P.E. Pressure Error

Air Data System



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