Telescope Interface Compatibility

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Recently an automatic UBVRI photometer has been under construction at the University Observatory, St Andrews, for use on the 1.02-metre telescope at the Royal Observatory, Cape Town. Two problems have been encountered which would seem to be of general relevance. Firstly a Cassegrain focus acquisition head, specific to the photometer, was required, and secondly a large rack of electronics must be shipped to South Africa. Clearly these problems have occurred to other guest observers, and it is suggested that they would be greatly reduced by the adoption of international standards, preferably through the IAU, relating to mechanical and electronic interfaces.

MECHANICAL COMPATIBILITY

A large proportion of auxiliary equipment is used at the Cassegrain focus where some form of wide-field acquisition head is necessary for finding the objects to be observed. The head may range from a simple mirror flap and eyepiece to one incorporating autoguiders and offset facilities. It is proposed that international standards be adopted in relation to the interface plates between the acquisition head and the auxiliary equipment. The accessibility of focus must be specified paying due regard to the requirements of standard equipment such as slit assemblies on spectrographs. It is proposed that a limited number of layouts (say three for different sizes of auxiliary equipment) should be adopted for the fixing bolt arrays and means of location, possibly following those in use at Kitt Peak National Observatory or close metric equivalents.

ELECTRONIC COMPATIBILITY

Although the control program of the St Andrews photometer is hard-wired, the current very low cost of mini-computers makes their use in control and data acquisition a very attractive and economic proposition even on small telescopes. It would therefore seem desirable that a standard modular computer interface system be adopted. This would simplify the exchange of programs and designs and also reduce the amount of electronics which the guest observer needs to transport. In addition, the system could be used in conjunction with laboratory measuring equipment.

The question of computer interface standards has already been studied by the ESONE Committee of the European Atomic Energy Community who have set up a standard for nuclear instrumentation called CAMAC.[1] Physically the system consists of one or more standard 19-inch (483 mm) crates, into which modules 17.2 mm wide or multiples of this width may be inserted. Each module is connected via an edge connector to a dataway at the rear of the crate and is interfaced to the computer through a control module at the right hand end of the crate. In multi-crate systems, local controllers in each crate are usually "daisy-chained" to a master crate which contains the main controller connected to the computer. In all arrangements only the latter module is specific to the computer used. Thus the CAMAC system allows complete freedom of choice of computer. On the telescope one or more crates could be placed at each focus. An important feature of the CAMAC system is that standard NIM instrumentation modules may be inserted into the crates using a simple adapter, although these modules naturally do not have direct access to the dataway. If required, a NIM module may access the dataway via a CAMAC module. It is proposed that CAMAC should be adopted as an international astronomical standard, possibly with slight modifications to suit astronomical applications.

In setting up standards it is essential that existing systems should not be invalidated and that departures from the standards where necessary should not be inhibited. The proposed acquisition head interface standard satisfies this condition in that it does not prevent the use of existing heads or of special purpose heads. The CAMAC standard also satisfies the condition. As the CAMAC system merely represents an additional peripheral, it can be paralleled with existing peripherals and does not prevent the addition of new on-line devices. Equally the instrument designer is allowed complete freedom to choose which features of the equipment are in hardware and which in software.

ACKNOWLEDGEMENT

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REFERENCE

1 *Euratom Report EUR* 4100 *e*, 1969.

DISCUSSION

R. E. NATHER: If the IAU sets Cassegrain fitting standards for mechanical instrument mounts, then as far as McDonald Observatory is concerned we would happily co-operate with anything that is established. This could be done very simply by providing an adapter plate from what we now have to what the new standard would be, and these would be made available to visiting astronomers. We would happily encourage this, strongly, because we are trying to promote the idea of other people doing photoelectric measurements of lunar occultations, and this involves transfer of equipment from one telescope to another, and will continue to be a serious problem. If this standard can be adopted, at least for the mechanical mounting, it will simplify our job enormously.

P. J. TREANOR: How far does the different mains frequency (60 Hz) in use in the U.S. complicate the problem of electronic compatibility, *e.g.* a modular computer control arrangement?

I. G. VAN BREDA: The power supplies in the CAMAC system are mainly D.C. and would be designed to suit the local mains supply. An optional 117 volts A.C. is also specified for the crate, at a frequency that lies anywhere in the range 47–63 Hz, and hence special modules are required only when timing circuits are used that rely on the mains frequency for their operation.

E. W. DENNISON: Hardware compatibility is straightforward, but what would you do about software?

I. G. VAN BREDA: It is proposed that basic software programs be written in assembly language, for access by Fortran or other high-level language, using the basic coding for each module. The instrument designer can then readily access any module and perform control logic and data reduction from within his main program.

J. D. POPE: There may be some difficulty in achieving the common instrument mounting faces at the Cassegrain foci of medium and large telescopes. Much will depend upon the type of guiding head to which the instrument must be attached. For example, where a telescope has a Cassegrain field of 14 inches' diameter and uses a two-probe guiding system working parallel to the focal plane, the guiding head is likely to be about 44 inches square. For maximum stiffness the Cassegrain instrument should be attached to the walls of the guiding head on a flange 44 inches square. Adapter plates would be needed to support instruments having more conventional circular mounting flanges of smaller diameter than 44 inches. As the offset guiding probes are necessarily close to the focal plane leaving perhaps only a 6 inch gap, it may not be possible to make an adapter plate with sufficient stiffness to support satisfactorily a spectrograph or photometer with a large overhung moment.

There is need for more technical discussions between the designers of large telescopes on this important matter of instrument mounting flanges.

I. G. VAN BREDA: There would certainly have to be more than one standard.

J. RÖSCH: As President of IAU Commission 9, I suggest that people here try to draft a resolution about standardization of telescope tailpieces for submission to the Commission at the General Assembly next week.