control of the photo-electric cell, which is linear to a few parts in 10,000 for a 10 to 1 light ratio, having grid leak values up to 10^{12} ohms in a D.C. amplifier giving a limiting sensitivity of about 10^{-11} lumen to get adequate sensitivity, obtaining a spectral resolution of about 0.0003μ in a 30-mm. spectrum and by producing masks by the Kodak etch-bleach process. The $\bar{x}$, $\bar{y}$, $\bar{z}$ and spectrum band masks are mounted on a wheel, and a blue temperature-conversion filter is used to compensate for the yellowing of sphere paint when it is part of the instrument.

A general discussion followed, and many aspects of spectrophotometry and colorimetry were considered. At the end of the discussion it seemed that the fully automatic recording spectrophotometers for ultra-violet and visible radiation made in the United States are giving good service, and that the photo-electric colorimeters developed in Great Britain are likely to give the same to colorimetry. It was pointed out that annular cathode photo-electric cells have been made in Britain.

The meeting was closed by a description and demonstration of the new Hilger Uvispek photo-electric spectrophotometer. This manually operated instrument, which covers the wave-length range from 0.21μ to 1.0μ , should be of great value in the field of spectrophotometry. H. G. W. HARDING

AUTOMATIC CONTROL-SYSTEM TERMINOLOGY

AT the request of the Ministry of Supply, the British Standards Institution is preparing a "Glossary of Terms used in Automatic Controlling and Regulating Systems". This is divided into four Sections, the second of which, on "Process Control"*, has been published recently; Section 3, which is in preparation, will cover the nomenclature of position control, and Section 4 will deal with automatic regulators; Section 1, which is to contain the terms common to all closed-loop servo systems, will be prepared when the other three have been completed. Every definition is given a four-digit reference number, indicating its section, subsection and position therein.

Section 2 is a welcome publication, representing the first serious attempt which has been made in Great Britain to bring some semblance of order into a field where chaos has reigned supreme. The existing confusion is due partly to historical accident, for the three main divisions of control engineering were developed separately by groups having little contact with each other. For example, the designers of engine-speed governors, of thermostats and of military fire-control equipment failed to appreciate in the early stages that they were all concerned fundamentally with the same problem: namely, that of increasing the accuracy of performance of their equipment, under ever more stringent conditions of load and disturbance, while maintaining an acceptable standard of stability in the system as a whole. It was due to this lack of contact that three separate systems of nomenclature are now current; not only is the same phenomenon referred to by several different names, but also, even worse, the same word

is often used by different engineers to indicate quite distinct phenomena.

The aura of mystery which surrounds the whole subject of automatic control in the minds of many engineers can be attributed largely to its illogical and unscientific terminology. In fact, the situation is even more chaotic than that stated above, for there is a considerable variety of usage even among the workers in a single field; a most valuable purpose will be served by the new glossary if it does no more than standardize the practice within each of the three separate fields, and it is to be hoped, therefore, that every control engineer will adhere to the recommended usage.

The glossary could be of more fundamental importance if it also helped to introduce a greater degree of uniformity between the separate fields of control. It is difficult, with only one part now available, to judge to what extent it will do this; but the task is undoubtedly a difficult one, for the technical differences between the fields are in some respects considerable, though by no means as great as is generally believed. It is regrettable, perhaps, from this point of view that it has been found necessary to separate the glossary into sections, for this will tend to emphasize a distinction which is in many instances more apparent than real.

As an example, consider the word 'offset' (definition 2203); in position control practice this is called the 'steady state error'. Is the latter term to be scrapped, or are we to have two names for the same thing? Again, is it impossible to persuade process control engineers to use the terms 'input', 'output' and 'error', in place of 'desired value', 'controlled condition' and 'deviation'? The former sound scientific, the latter sound amateur. The sign of the deviation is defined differently from what is customary for *position* control in Great Britain and in the United States. The Americans are unlikely to alter their practice, so that this will perpetuate the present ridiculous anomaly of having two contradictory definitions in use simultaneously; for it is a sad fact that the only books on control engineering come at present from the United States.

The intention is to review the present standard in a year, and suggestions for improvement are requested. The following comments may therefore be of some value. Terms for 'input element' and 'difference element' are not defined; they might be combined to form an 'input unit'. 'Measuring unit' (2106) is defined in terms of 'measuring element', which is listed among those terms the use of which is deprecated; this emphasizes the point that it is, in fact, necessary. 'Floating control' is not mentioned as a synonym for 'integral action'; it should at least be given, if only to deprecate this common usage. 'Proportional band' (2502) has another meaning, different from that given, namely, "the range within which controller action is linearly related to deviation"; if its use in this sense is deprecated, some alternative should be provided. Finally, the term 'two-step action' (2408) is an unsatisfactory alternative to 'two-position action' (deprecated), since such a control has only one step, though it has two positions.

It would, of course, be possible to make other minor criticisms; but these do not detract from the entirely admirable intention behind this glossary and the treatment which, so far as one can judge at present, maintains the high traditions of the British Standards Institution. R. H. MACMILLAN

* British Standard No. 1523:1949. Glossary of Terms used in Automatic Controlling and Regulating Systems. Section 2: Process Control. Pp. 21. (British Standards Institution, 24/28 Victoria Street, London, S.W.1.) 2s. 6d.